INSIDE: WOLVES OF THE WATER

Montana Outdoors

MONTANA FISH, WILDLIFE & PARKS | $3.50

JULY–AUGUST 2018

A CALL FOR HELP

In 1918, Congress responded with migratory bird protections. Are those still working today?

IN THIS ISSUE:

50 YEARS OF TRAIL CREATION

CAUTION: GIANT WATER BUGS AHEAD

WHY SPARROWS AND SHINERS MATTER

WHAT HAPPENS AT THOSE AIS INSPECTION STATIONS?

FIRST PLACE MAGAZINE: 2005, 2006, 2008, 2011, 2017
SECOND PLACE MAGAZINE: 2007, 2009, 2012, 2015, 2016
Awarded by the Association for Conservation Information

FIRST PLACE MAGAZINE: 2012
Awarded by the National Association of Government Communicators

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THE WAITING GAME A northern pike waits for prey in a forest of underwater vegetation. Learn more about this sharp-toothed piscivore on page 36. Photo by Paul Vecsei/Engbretson Underwater Photography

FRONT COVER Sandhill cranes and other migratory birds received a big break in 1918 with passage of the Migratory Bird Treaty Act. Will those protections continue? See page 22. Photo by Donald M. Jones.

Bull trout in films

I very much enjoyed your informative article on bull trout conservation in Montana ("An Upstream Struggle," May-June). Your readers might be interested in learning more about how people are helping conserve bull trout at the local level. The Lower Clark Fork Watershed Group works closely with our local FWP staff and other partners to restore stream habitat in tributaries to the lower Clark Fork River. We recently completed short films documenting two of our projects, one on the Bull River south of Troy, and another on the Vermilion River north of Trout Creek. View these films on YouTube by searching for "Roots: Bringing Back the Bull River" and "Pulse: A Story of River Restoration."

Brita Olson, Coordinator
Lower Clark Fork Watershed Group
Trout Creek

Money maker?

Regarding FWP's funding dilemma, as described in several past issues of *Montana Outdoors*: I believe you could generate additional funds by adding more opportunities for sportspersons to donate to a worthy cause when purchasing their online license. You currently have options for Hunters Against Hunger and Montana Public Lands Access Network (MT-PLAN). Why not add additional categories, such as fish and wildlife habitat, education, enforcement, and whatever else makes sense? You might also try a "round up to the nearest dollar" donation such as Cabela's does for conservation. I would

gladly donate through a "round-up" feature or to other "important to me" funding projects. I have donated to PLAN and Hunters Against Hunger and wish there were more options. I'm certain others would feel the same way.

Duane Ziegler
Miles City

Simple suggestion

After reading the article on the struggles of bull trout, I have a simple suggestion for the West Fork of the Bitterroot River from Painted Rocks Dam to the confluence with the East Fork: Ban all bait fishing. There are five species of salmonids in the river: bull trout, cutthroat, rainbow, browns, and an insignificant number of eastern brook trout. Banning bait fishing would significantly reduce harm to the numerous young bull trout in the river. On a recent trip with my longtime outfitter, I inadvertently hooked and released a "double" of young bulls. You might also consider banning all fishing above the dam put-in, where adult bulls congregate.

Thomas E. Duquette
Millboro, VA

Tepid and biased?

I can't believe you published that factless and fiction-filled letter with fake data about raptor lead poisoning in the May-June issue. What stoked my ire even more was the editor's tepid, almost apologetic response. I'm done accommodating these lying bullies by being a politically correct snowflake. I just wish others

> **"What stoked my ire even more was your tepid, almost apologetic response.**

with real data would do the same. Colleagues and friends who are eagle and condor biologists (many in California) have recovered far too many dead and dying eagles poisoned by lead. And that's the truth.

Alan Harmata
Bozeman

Let me start by saying that I usually enjoy your publication. I was, however, disappointed in your editor's reply to the letter on the article that mentioned eagles and lead poisoning. My freshmen and sophomore students know better than to make statements such as "It's widely accepted" without supporting the statement with sources or data to back it up. Your failure to do so just underscores the letter writer's concerns about bias. Conservation must be based on science, not unsupported statements.

George Pierce
Lincoln

TMI, FWP?

On the one hand, I applaud FWP's efforts to create a new FishMT website that gives the public access to "all things fisheries related" ("One-Stop Shop," May-June). On the other hand, I have concerns about the unintended consequences it could have on the resource. Today's social media and information-centric environment have more or less eliminated the old-fashioned (and, dare I say, more rewarding) methods of gaining knowledge about the rivers and streams we fish. Nowadays, a "click" on a river provides the soup-to-nuts information that has traditionally required on-the-ground effort. With fishing resources experiencing increasing levels of pressure as the years roll on, I think it's important that we consider all aspects of how technology is contributing, both positively and negatively. That said, my hats off to FWP and *Montana Outdoors* for all your great work.

Bill Schell
Alder

Speak your mind

We welcome all your comments, questions, and letters to the editor. We edit letters to meet our needs for accuracy, style, and length. Write to us at Montana Outdoors, *P.O. Box 200701, Helena, MT 59620-0701. Or e-mail us at: tdickson@mt.gov.*

Shredded Venison Barbacoa Tacos

By David Schmetterling | Preparation time: 30 minutes | Cooking time: 3–10 hours | Serves 12–20

SHUTTERSTOCK

Barbacoa is a technique of Caribbean origin for cooking large cuts of meat over a fire or pit of coals. It's also the origin of "barbecue," and has been adapted into northern Mexican and southwestern United States cuisine. For this recipe, barbacoa refers to the Caribbean ingredients used in the meat rub and braising process. No fire or pit required.

Traditional barbacoa uses goat or pork. I like the sinewy neck meat from a pronghorn or deer that has been braised "barbacoa style" for making tacos. Tough cuts from the shoulder work well too, as does a beef chuck roast or tougher cuts of elk.

A tip for those who have never bothered to save the neck meat of a deer or pronghorn: Fillet it right off the vertebrae in several large slabs. Once home, layer the slabs and truss them into a boneless rolled roast (see YouTube videos for tips on tying a rolled roast). There's no need to trim off connective tissue or fat. During the slow-cooking process, it will melt away into a flavorful goo that moistens the meat.

The dish takes some time to plan and prepare, but the taste more than makes up for the effort. Also, once you finish with the barbacoa, you'll have several pounds of delicious shredded meat to freeze for camping overnights or making quick tacos after work.

If you don't have a smoker, find a friend who does. Otherwise, skip the smoking step (though still make and apply the rub).

To find an authentic recipe for these tacos, my wife, who's from a small agricultural town with a strong Mexican American community, contacted an old high school friend who loves food. He was delighted to help.

While the meat for these barbacoa tacos is delicious, the salsa, queso fresco, and other accompaniments are equally so. When added to the smoky shredded venison, they create a unique combination of flavors and textures unlike anything you've ever tasted.

—David Schmetterling coordinates the FWP Fisheries Research Program.

INGREDIENTS

5 lb. boneless rolled venison neck roast or beef chuck roast

RUB

1 T. salt
1 T. chili powder
2 t. oregano
2 t. onion powder
1 T. cumin
1 T. garlic powder

COOKER

16 oz. salsa verde (homemade or canned)
7 oz. can chipotle in adobo sauce
1½ T. cumin
1 T. oregano
¼ t. ground cloves
2 T. minced garlic
¼ c. lime juice
Salt and pepper to taste
Water

SALSA

½ c. chopped cilantro leaves
1 c. diced white onion
¼ c. lemon juice

DIRECTIONS

Mix the rub ingredients and massage the mixture onto the roast. Smoke for 3 hours at 225 degrees.

Remove roast from the smoker and place in a slow cooker or Dutch oven. Add the cooker ingredients and enough water to just cover the roast. For a slow cooker, cook on low for 10 hours. For an oven, cook at 285 degrees for three hours.

Remove roast from the cooker or oven, let cool 10 minutes, then shred the meat with your fingers or a large fork. Remove any chunks of cartilage that didn't melt.

Make the salsa by combining the cilantro, onion, and lemon juice in a small bowl

Serve the shredded meat in warmed corn or flour tortillas topped with sliced radish, queso fresco (a delicious crumbly, salty cheese available in many grocery stores), and the salsa.

What we've accomplished so far

When I was hired as FWP director a year and a half ago, my top priorities were for the agency to improve customer service, increase collaboration with communities and other agencies, become more transparent, and create more internal cohesion among FWP employees, divisions, and regions. The intent has been to build public support for a more agile and resilient agency able to meet current and future challenges.

Here's some of what we've accomplished:

Customer service: Our field staff, headquarters staff, and front desk crews provide great service, but they and everyone else in FWP are making an effort to do even more. I've asked that we always try to respond to public concerns with, "How can I help?" Though we can't fulfill every request, we can try—or at least explain why we can't. I have also convened an internal department working group to review all hunting, fishing, and trapping regulations. The goal is to make the regulations easier to understand and use, something FWP has never attempted on such a large scale.

Collaboration: Fish, wildlife, and state parks issues increasingly affect communities, nonprofit groups, private citizens, and other state and federal agencies. We've learned that FWP must collaborate even more to ensure that everyone affected by our decisions has a say in how they are made. One example of collaboration is our work with tribes, towns, landowners, and federal agencies to resolve conflicts between bears and people. We've also teamed up with the Confederated Salish and Kootenai Tribes, Blackfeet Tribe, Missoula County, Garfield County Conservation District, Whitefish Lake Institute, Glacier National Park, Bighorn Canyon National Recreation Area, and other groups and agencies to prevent the transport and introduction of aquatic invasive species.

Transparency: This director's message you're reading is one example of FWP's commitment to being open about what we do. Another is how, in our daily interactions with local and national media, we quickly and candidly answer questions ranging from budgets to grizzly bears to strange wolflike creatures. Our goal is to be the best source of information about the department and the resources we manage. We've also been putting our finances in order to more precisely show where our revenue comes from and how we spend it.

Internal cohesion: To keep Montana a great place to live and visit, all of us who care *about* the outdoors need to team up to care *for* the outdoors. The first step is for everyone in FWP to pull together and ensure we're all working toward the same goals. I've traveled to FWP offices across Montana to explain how all of us share the same core values (such as embracing the public trust and basing management decisions on sound science) and beliefs (opportunity outside, inclusion, integrity, and balance). I've urged our employees to think and act collectively as they tackle management issues such as the need for more public access.

In April we held an all-staff meeting, something FWP had never done before. Nearly 600 employees came together in Helena to embrace the idea of a more unified department based on the recognition that we are all one agency. Employees were introduced to a new FWP tagline—"The Outside Is In Us All"—created as a message that welcomes everyone who wants to connect with Montana's outdoors.

This past spring, FWP held its first-ever all-staff meeting. Nearly 600 employees came together from all corners of Montana to meet and learn from each other and lay the foundation for building a more cohesive and effective public agency.

I'm only partway through my four-year term as director, so it may be a bit too early for people to notice the results of these efforts. But you'll soon see more visual consistency in FWP publications and electronic media, reinforcing department cohesiveness and coordination. You'll receive more smiles from our staff, and more offers of help. Citizens and elected officials who work with us regularly will also notice that we're pulling together internally so that FWP can be more effective externally in uniting people to help us protect the integrity of the Montana outdoor experience.

—**Martha Williams**, Director, Montana Fish, Wildlife & Parks

FWP has produced a short new video that conveys why the department matters to Montana. Search for "The Outside Is In Us All FWP" on YouTube.

MONTANA FWP

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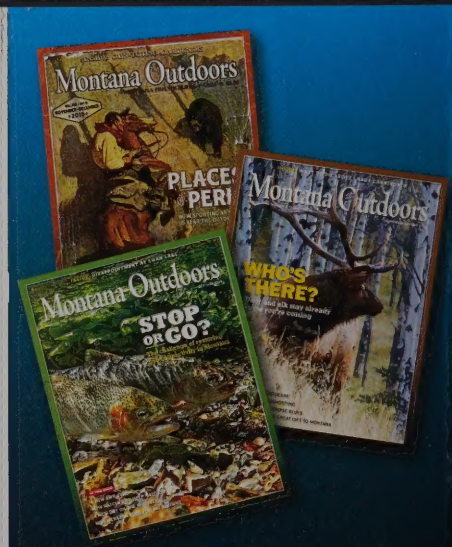

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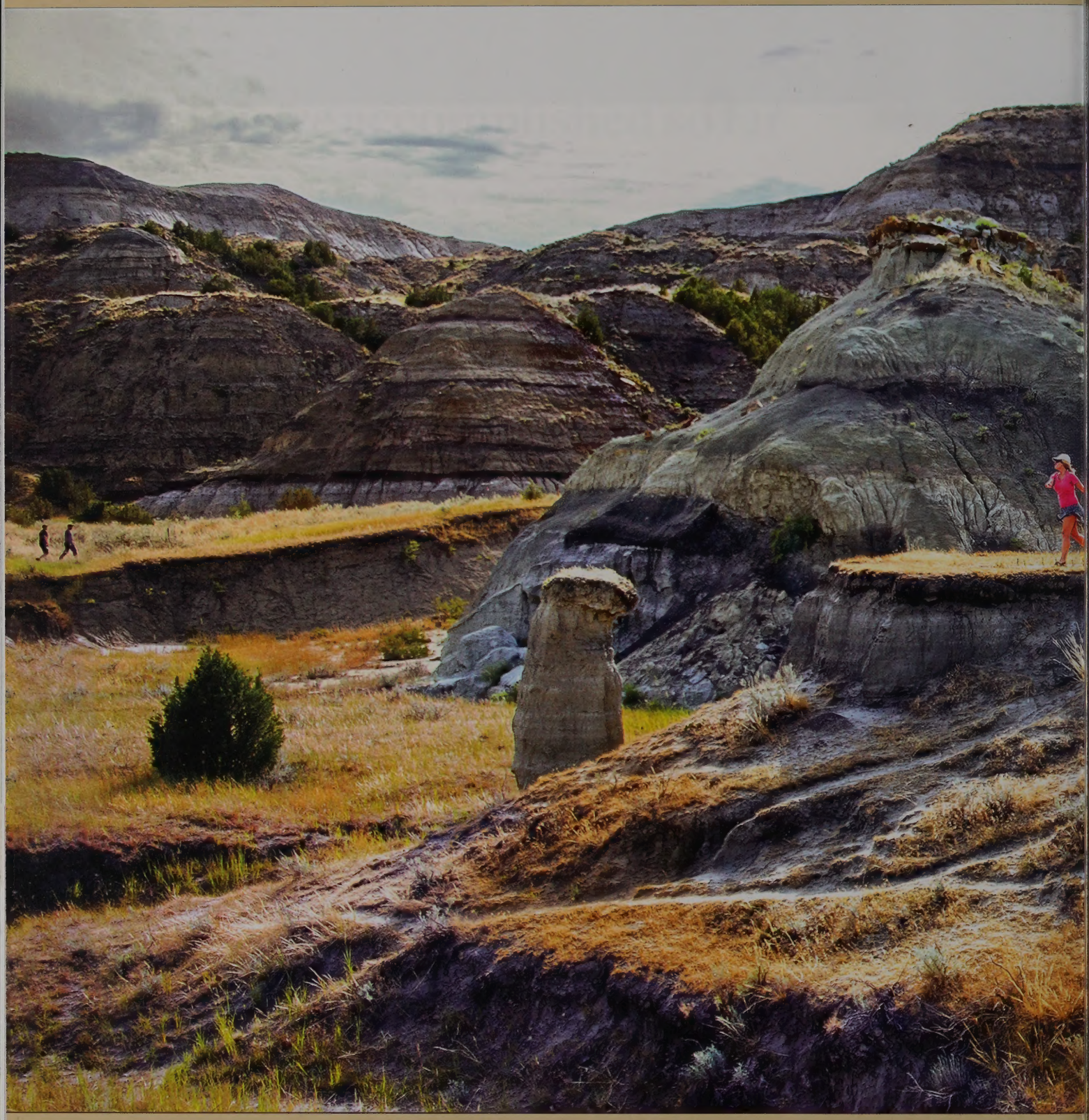
JEREMIE HOLLMAN

EXPERIENCE CONNECTOR

BRIAN SCHWARTZ
Park Manager at Lone Pine, Lake Mary Ronan, and West Shore (Flathead Lake) State Parks

What I like most about being a park manager is helping people connect to the outdoors. I love being outside, especially with my wife and our four kids, ages four to 12. We canoe, camp, hike, and hunt ducks. I want others to have those and other great outdoor experiences. As a park manager, I have the knowledge to connect park visitors with whatever it is they might want to see or experience outdoors: what wildflowers are blooming, where I've seen mountain lion tracks, or where they might spot a least weasel.

I tell the amazing staff and dedicated volunteers here at Lone Pine that, as busy as we all are, we always need to take time to help connect our guests to the outdoors. This is Montana, and the reason we visit or live here is because we love the outdoors. The more that people experience all this state has to offer, the more they'll value it and take the time and effort to help us protect it.



While driving through Makoshika State Park near Glendive on a photo assignment, **John Warner** came over a rise and was surprised to see a disc golf course. "It was like a scaled-down version of the Makoshika badlands with a course built right into it," says the Billings photojournalist. Warner asked a twosome playing the course if he could follow for a few holes and take photos. "It was a mother and her adult son, and they'd bought discs at the park visitor's center and were having a great time. Whoever came up with that idea for a disc golf course out there deserves recognition, because it's really cool."

Millions of acres of Conservation Reserve Program grasslands converted to crops in Montana since 2007

(Source: USDA)

New FWP tagline

What do kayakers, elk hunters, fly anglers, backpackers, and bird watchers have in common? They all enjoy being part of the outdoors. In Montana, that desire is almost universal. "In other states, people go outside," says Greg Lemon, head of the FWP Communications and Education Division. "But in Montana, the outside is already inside us. It's in our DNA."

Recognizing that deeply and widely held value, FWP recently released a new agency tagline, "The Outside Is In Us All." Developed in partnership with Missoula-based Partners Creative, the statement highlights the common ground shared by all who recreate outdoors. "It also reminds everyone that FWP conserves and manages the rivers, trails, fisheries, parks, wildlife, and public access that make so many outdoor opportunities possible," Lemon says. ■

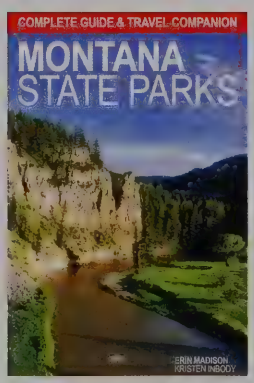
Belt Creek in Sluice Boxes State Park

STATE PARKS

Making it easy to visit

Over the past decade, visitation to Montana state parks has doubled. Yet many people are still unaware of just what those 55 state parks have to offer. Outdoor writers Erin Madison and Kristen Inbody can help.

Their essential *Montana State Parks* guide provides summaries of 54 state parks across Montana (Milltown, the state's newest state park, wasn't open when the writers researched their book). The pair criss-crossed Montana to visit every single site, calling their year-long adventure the Extreme Montana State Parks Challenge. "Every park was a chance to experience the state more deeply. I fell in love with Montana all over again," says Inbody.



For each park, the writers include information on amenities such as boating, hiking, swimming, and camping; open hours and days; contact information; and a brief description and history. Each chapter also features a map, photos, and a "Don't Miss" highlight, such as the scenic tents-only campsites at Wayfarers State Park on Flathead Lake and the buffalo jump at Rosebud Battlefield State Park.

"This is such a great way to realize all the different options our parks provide," says Beth Shumate, head of the FWP Parks Division. "Boating, fishing, interpretive hikes, special events, cultural sites, car tour camping, yurts—you name it, we've got it at our state parks, and it's all here in this fantastic book."

Montana State Parks is available for $19.95 at local bookstores. A portion of sales is donated to Montana's Outdoor Legacy Foundation to support state parks. ■

FISHERIES

Welcome the high water

With mountain snowpack well above average across western Montana, spring runoff caused rivers to roil with high water well into June. That was tough on anglers, already bummed out over what seemed like the world's longest winter. But all that big water is great for trout.

Heavy river flows clean out gravel where trout spawn and aquatic insects live. The flooding flushes silt and vegetation that smothers trout eggs and clogs mayfly, caddis fly, and stonefly habitat. "Heavy flows also move gravel around, scouring it from one place and depositing it downstream on the next bend, creating new habitat," says Grant Grisak, FWP regional fisheries manager in Great Falls.

The big trout you catch in 2024 might exist thanks to the high water of 2018.

Strong spring runoff also creates more habitat for young trout by inundating floodplains and side channels where the tiny fish find food and avoid predators. This is especially important during the first few months of life when young fish are most vulnerable.

It's now summer, and water levels have finally dropped, rivers are fishable, and anglers are happy. They can take added pleasure knowing that the high water that delayed their fishing improved habitat and created healthier fisheries. ■

Two essential dries

Walk into any Montana fly shop and you'll quickly be overwhelmed by the multitude of dry-fly patterns: PMD emergers, *Baetis* cripples, slack-water and downwing caddis, Trudes. Wouldn't it be great if you could just use one or two flies, in various sizes, and forget the rest?

Dave Whitlock says you can. The author, instructor, and creator of the Dave's Hopper and other famous patterns told *Field & Stream* recently that the Parachute Adams and Royal Wulff may be the two most effective dry-fly patterns ever invented. The Adams is what's known as a "suggestive" pattern, not meant to replicate an actual floating insect but rather resemble something generically "buggy" on the surface. "It matches almost any dun mayfly or caddis you'll come across," Whitlock says. The "parachute" version has a white hair top that makes it easier to see. The other go-to pattern is the Royal Wulff, "basically an attractor fly [that] looks real buggy," says Whitlock.

Whitlock suggests carrying both patterns in a range of sizes. Use flies that are the same size as or smaller than the bugs you see on the water surface. "If you err in terms of fly size selection, be too small rather than too large," he says. ■

CLOCKWISE FROM TOP LEFT: CARTOON BY MIKE MORAN; JOHN LAMBING; ED COYLE; SHUTTERSTOCK; *MONTANA OUTDOORS*

INTACT

How a 10-year FWP project protects one of the nation's largest populations of pure-strain westslope cutthroat trout. By Becky Lomax

When Kalispell angler Tony Anderson hiked into the Jewel Basin Area with Montana Fish, Wildlife & Parks biologists to check on Blackfoot Lake in 2009, he expected the worst. "I figured it was a dead bowl of water," he says. FWP had treated the lake two years earlier with a fish toxicant, removing the existing non-native fish, and stocked it with pure-strain westslope cutthroat trout. Anderson and many others had denounced the ambitious plan to reestablish westslope cutthroat populations in 21 remote, high mountain lakes. They feared the project would poison the environment and waste anglers' license dollars.

But at Blackfoot Lake, Anderson watched a fisheries technician lift a fine-mesh net wriggling with aquatic insects. He saw frogs swimming in the shallows. Once he began to fish, on his second cast he hooked and landed a 17.5-inch pure-strain westslope. "It was so beautiful, and so fat from all the food in the water," Anderson says. "I sat down on the shoreline, actually shaking with excitement. They were right. The project was a huge success."

Now that the 10-year South Fork Flathead Westslope Cutthroat Trout Conservation Program is complete, Anderson and others acknowledge that the controversial project has protected the river's nationally renowned pure-strain westslope cutthroat trout fishery. A joint project of FWP, the U.S. Forest Service (USFS), and the Bonneville Power Administration, it has also created strongholds of Montana's state fish in 21 lakes—sources of trout that could be used for future restoration efforts. What's more, the project neither created ecological havoc nor drained the FWP fisheries budget.

These achievements required overcoming tremendous obstacles. The largest westslope cutthroat trout restoration in history, the project spanned a 1,681-square-mile watershed. Much of it took place in wilderness that called for new ways of transporting fish and equipment. It required eliminating existing non-native trout populations at a scale never done before. And it meant converting a fish farm into a "genetic conservation facility" for

PATRICK CLAYTON/ENGBRETSON UNDERWATER PHOTOGRAPHY

BELOW-WATER BEAUTY A pure-strain westslope cutthroat trout swims in the South Fork of the Flathead River. The population is one of largest and best protected in the United States.

rearing pure-strain westslope cutthroat. "It was a massive and sometimes frustrating undertaking," says Matt Boyer, FWP's lead field biologist for much of the project. "But it was definitely worth it to achieve long-term native fish conservation on such a landscape scale."

ONLY 10 PERCENT REMAINING

For thousands of years, the westslope cutthroat trout swam in waters throughout the northwestern United States and western Canada. During the 20th century, its range and numbers substantially declined. Indiscriminate logging removed forest canopy that kept streams cool, while logged hillsides bled silt into streams, smothering trout eggs and aquatic insects. Just as harmful were rainbow, brook, and brown trout introduced decades earlier by state and federal agencies.

The non-native fish outcompeted young westslope cutthroat for limited food. The rainbows also interbred with the closely related westslope, creating a "cutt-bow" hybrid whose swelling populations threatened to extinguish the shrinking number of pure-strain natives. Two centuries after Lewis and Clark had scientifically described the species in their journals, the range of genetically pure westslope cutthroat populations had decreased by 90 percent.

Genetic purity is vital for a native population's long-term health. "These fish have adapted over thousands of years in a wide range of environmental conditions," Boyer says. He explains that trout that have survived ice ages, droughts, floods, forest fires, and other natural extremes possess genes that will help future generations endure similar onslaughts.

PRISTINE PLACE The South Fork of the Flathead runs north from the heart of the Bob Marshall Wilderness. From 2004 to 2014, FWP removed non-native trout from 21 lakes that were "leaking" fish into the river downstream and replaced them with pure-strain westslope cutthroat

The South Fork has some of the largest intact habitat for genetically pure westslope cutthroat trout in the United States. Its headwaters are Youngs and Danaher Creeks in the middle of the Bob Marshall Wilderness, about 50 miles northeast of Missoula as the crow flies. The river flows north along the east flank of the Swan Range and eventually meets two other forks near Columbia Falls. The three forks form the Flathead River, which proceeds south into Flathead Lake.

The South Fork's westslope cutthroat population is healthy and intact for two main reasons. The mountain lakes and streams that feed it all summer long are cold and clean. And the native trout population is protected by Hungry Horse Dam, completed in 1953, from invasion by rainbow trout and other non-native species downstream.

Yet one threat has long worried trout conservationists. Decades earlier, 21 of the 335 lakes in the watershed were stocked with Yellowstone cutthroat trout and rainbow trout. (Yellowstone cutthroat are native only to the Yellowstone River drainage.) Though FWP has since stocked only genetically pure westslope cutthroat trout in the lakes, those fish bred with the Yellowstone cutts and rainbows to create hybrids. Some of the lakes, on the east side of the Swan Range, "leaked" hybrids from their outlets into streams that flow downstream into the South Fork, threatening the river population's genetic purity. "We were losing the pure-strain westslopes awfully fast, and once they're gone, they're gone for good," says Brian Marotz, former manager of the westslope conservation program.

ANGRY LETTERS

Like all large-scale fisheries conservation projects, this one began with large-scale

MAP: LUKE DURAN/MONTANA FWP; HUNGRY HORSE DAM: JEREMIE HOLLMAN; FISH MANAGEMENT/STOCKING PHOTOS: MONTANA FWP

Whitefish-based writer Becky Lomax is a longtime contributor to Montana Outdoors.

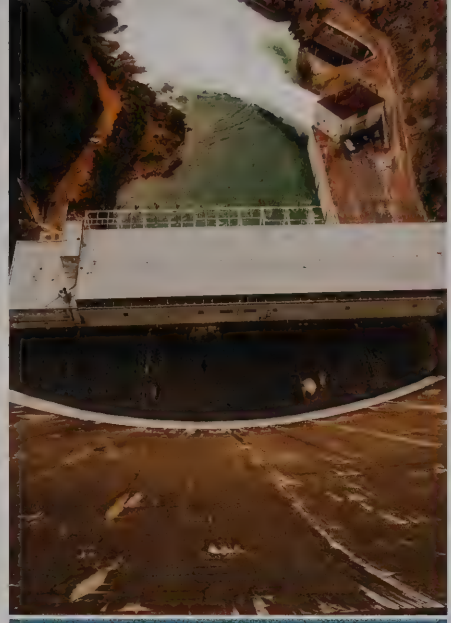
TAKING OUT THE WRONG FISH From left to right: A helicopter transports boats and supplies to Margaret Lake; unpacking barrels of rotenone used to kill an existing population of non-native fish; launching boats to carry rotenone onto Lena Lake for dispersal.

paperwork. FWP, Bonneville Power, and the USFS, which manages wilderness and national forest lands in the watershed, prepared a draft Environmental Impact Statement for public review in 2004. The proposal called for removing all existing fish using the toxicant rotenone and replacing them with pure-strain westslope cutthroat.

Critics decried the massive expense required to restore fisheries on such a large scale in such remote areas. Even louder objections came over the use of rotenone. "Poisoning a stream should be a hangin' offense," one angry Kalispell resident told Marotz. Letters in the *Daily Inter Lake* denounced FWP for using a chemical the authors feared would kill other wildlife, linger in the food chain, and pollute downstream drinking water supplies.

FWP answered the concerns. "We hosted public meetings and met one-on-one with our most vocal critics to clear up misconceptions," says Marotz. He and Boyer explained that no additional angling license dollars would go to the project. Bonneville Power would foot the bill with funds already earmarked as mitigation for Hungry Horse Dam's construction and operation.

As for the rotenone, Marotz and Boyer explained that the chemicals in the plant-derived toxin are harmless to humans at levels used in the projects. They break down rapidly and kill only gill-breathing organisms (by preventing oxygen from crossing gill filaments). Because these include all fish as well as amphibians and the nymphal stage of mayflies and caddis flies, "we used potassium permanganate to neutralize the toxin downstream of lake outlets so that gill-breathing creatures there weren't harmed," Marotz says.



NO WAY PAST Though dams generally don't help native fish species, Hungry Horse Dam actually protects the population upstream from hybridization with non-native rainbows downstream.

Scientists have shown that insect populations rebound rapidly after rotenone application. FWP biologists documented all lake life before each treatment to confirm that every invertebrate species returned afterward. "If that weren't the case, it would be entirely counterproductive to use rotenone as a restoration tool, since we'd be harming the food source for the very fish we're working to conserve," says Boyer.

After Anderson's visit to Blackfoot Lake, one of the first treated with rotenone then restocked with pure-strain westslope cutthroat, the Kalispell angler became a project ambassador. "I'd seen it firsthand and was sold," he says. "I told people that I understood their fears, but I'd seen with my own eyes that the aquatic life in those lakes, including the trout, were doing fine."

MAKING A SPECIALIZED HATCHERY

Before non-native trout could be removed from each of the 21 lakes, FWP needed pure-strain westslope cutthroat to replace them. With Bonneville Power funding, FWP leased a rainbow trout farm at Sekokini Springs on USFS land near West Glacier. After the owner removed his 60,000 rainbows, biologists converted the spring-fed hatchery into a cutthroat facility.

Instead of rearing young fish for stocking from just any old westslope cutthroat, Boyer and his team collected genetically pure westslope cutthroat from streams near each of the targeted lakes. "These locally adapted genes maximize the potential for an individual fish to survive and reproduce," he says. Horses carried the fish out in coolers lined with trash compactor bags and filled with ice. Over several years of fish collection, more than 90 percent of the fish survived the journey.

At the hatchery, FWP hatchery manager Scott Relyea and fisheries technicians manually spawned the trout. After extracting the

BRINGING IN THE RIGHT FISH Left: FWP workers load a helicopter bucket from a hatchery truck for stocking a backcountry lake. Above: Fish are transported via pack horses to Lena Lake.

GENETIC CONSERVATION FACILITY Scott Relyea, manager of FWP's Sekokini Springs hatchery near West Glacier, checks on genetically pure westslope cutthroat trout fry. Once they reach fingerling size (below), and have been screened for pathogens and verified for genetic purity, the fish are stocked in 21 lakes in the South Fork of the Flathead watershed.

white, milky milt from males, they checked it under a microscope to confirm viable sperm content. Then they squeezed eggs out of ripe females into metal bowls and mixed in the milt. The fertilized eggs were rinsed, placed in coded containers, then incubated for 20 days to produce fry (half-inch-long baby trout).

Unique among Montana's hatcheries, Sekokini Springs quarantines fish for pathogen screening and genetic purity verification. Once a westslope cutthroat population passes the tests, it is "certified" to be used for the South Fork project.

Converting each of the lakes took several years. Crews applied rotenone in the fall. That helped protect amphibians, which move from water or burrow deep in mud when temperatures drop. After ice-out in early summer, crews returned to ensure the treatment was effective and the lake was fishless. In midsummer, they refilled the lake with hatchery-spawned fish.

Delivering rotenone, boats, nets, hatchery trout, and other items to remote lakes required a range of transportation methods. Crews backpacked inflatable rafts, nets, and other gear to all the lakes except one that could be reached by road. On most lakes, helicopters delivered 30-gallon drums of fish toxicant. In two large lakes, single-engine aircraft tankers administered the rotenone to speed up the process and reduce site disturbance. Horses and helicopters delivered fish for restocking.

Fifteen lakes were treated with rotenone. The other six were managed with "genetic swamping"—adding large numbers of pure westslope over several years to dilute nonnative genes.

For a few more years, Relyea and his team will continue to produce new year-classes of pure-strain westslope cutthroat for stocking until populations become self-sustaining through natural reproduction in streams feeding into the lakes.

COLD AND PURE

With their vibrant red chin slashes and orange-hued undersides, the genetically pure westslope cutthroat now swimming in the 21 lakes signal the project's success. "Aside from the footprint of Hungry Horse Reservoir, the South Fork's habitat is largely intact with no

CLOCKWISE FROM TOP LEFT: PAUL QUENEAU; JEREMIE HOLLMAN; JEFF ERICKSON; TODD PEARSONS/ENGBRETSON UNDERWATER PHOTOGRAPHY

> “I’d seen with my own eyes that the aquatic life in those lakes, including the trout, were doing fine.”

immediate threats from human interaction, invasive species, or habitat modification,” says Sam Bourret, lead FWP biologist during the project’s final two years. “The primary threat now is climate change, but because these lakes are at high elevations, the cold water they contain provides some buffer against warming temperatures.”

As strongholds of genetically pure trout, the lakes are attracting anglers and others. “Many hikers and backpackers enjoy knowing there are native fish in wild places like the South Fork, and that those environments are functioning naturally as they have for thousands of years,” says Mark Deleray, FWP regional supervisor in Bozeman (and regional fisheries manager in Kalispell during much of the restoration work).

The restored lakes still leak some trout from their outlets into the South Fork of the Flathead, miles downstream, but now those fish are pure-strain cutts. The river continues to draw anglers and rafters with its aquamarine waters, wilderness setting, and native salmonids. Says Boyer, “Anglers can find opportunities to fish for rainbow trout pretty much anywhere in the world, but there are very few places left where you can catch pure-strain westslope cutthroat. To many people, those fish are a large part of what makes the South Fork such a remarkable place.”

CHANGE OF HEART Kalispell angler Tony Anderson was skeptical about FWP’s project to replace non-native trout in the South Fork of the Flathead watershed with pure-strain westslope cutthroat. “I had to see it for myself,” he says. “Once I did, I was completely on board.”

As for Anderson, he says he feels proud to have assisted in moving the project forward by helping fellow anglers overcome the same skepticism he’d once had. “I told people that, just like the bald eagle is our national bird, the westslope cutthroat trout is our state fish,” he says. “It would be a disgrace if we didn’t do everything in our power to preserve it.”

Meet the AIS "Pit Crews"

With the speed and professionalism of NASCAR support teams, aquatic invasive species inspectors make sure boaters don't transport unwanted plants and animals into Montana's lakes, reservoirs, and rivers.

By TOM DICKSON. Photos by JOHN WARNER

We know that summer has truly arrived in Montana when "STOP: Watercraft Inspection Ahead" signs spring up along motorways across the state. These inspection stations, operating since 2004, have proliferated over the past few years. Montana Fish, Wildlife & Parks and other agencies have increased efforts to prevent boats from transporting aquatic invasive species (AIS) such as foreign mussels, Eurasian watermilfoil, and New Zealand mud snails into Montana waters. The non-native plants and animals, which hitchhike on boats, motors, trailers, and other equipment, can invade lakes and rivers and cause costly problems for fisheries, irrigation, and hydropower facilities.

"Moving AIS around is a human-caused problem that's preventable," says Thomas Woolf, chief of FWP's Aquatic Invasive Species Bureau. "Boaters need to do their part to clean their boats and gear to protect Montana's valuable waters."

Most inspection stations are staffed with FWP watercraft inspectors, seasonal employees trained to provide fast, thorough, and efficient inspection.

Billings photographer John Warner, who shot these photos at a busy inspection station at Canyon Ferry Reservoir last summer, says he was struck by the inspectors' speed and professionalism. "When a boat pulled in, they were like a NASCAR pit crew, going to their

THE BOAT STOPS HERE FWP aquatic invasive species inspectors at Canyon Ferry begin an inspection process to ensure boats entering and exiting the popular reservoir are not carrying tiny plants and animals that could create costly damage to fisheries, agriculture, and industry.

stations and each doing their specific task, whether it was the interview, the inspection, or using the [decontamination] sprayers."

In 2018, more than 40 inspection stations are set up at key locations. State law requires that all watercraft entering Montana, crossing the Continental Divide, and entering the Flathead Basin with intent to launch must be inspected.

FWP inspections occur at 17 roadside stations, eight decontamination stations at Canyon Ferry and Tiber, and 10 regional and area offices. Additional stations are run by other agencies and organizations in partnership with FWP.

During a watercraft inspection, which usually takes less than 10 minutes, an inspector interviews the boater to determine the likelihood that the vessel is transporting AIS. Low-risk boats, which have previously been cleaned, drained, and dried, receive proof of inspection and a seal. High-risk boats (those containing standing water, weeds, or mud or arriving from a state, province, or waterbody containing invasive mussels) are decontaminated with a high-pressure washer in a process that takes from five to 30 minutes depending on the vessel.

"Boaters can really speed things along if they arrive at the inspection station already cleaned, drained, and dried," says Liz Lodman, information officer for FWP's AIS Bureau. Lodman also urges fly anglers to clean and dry their felt-bottom wading boots and other fishing gear between outings.

FWP cooperates with neighboring states and provinces on AIS control, and it works with the Confederated Salish and Kootenai Tribe, Blackfeet Tribe, Missoula County, Garfield County Conservation District, Whitefish Lake Institute, Glacier National Park, and Bighorn Canyon National Recreation Area to ensure that procedures at watercraft inspection stations are consistent.

The inspections pay off. Sixteen of the 71,000 vessels inspected in 2017 contained invasive mussels and were decontaminated before they could enter Montana waters. Already in 2018, FWP watercraft inspection stations have intercepted several out-of-state boats carrying zebra mussels.

Just like applying sunscreen, keeping your boat free of aquatic invasive species is now a permanent facet of summer in Montana. "Many states and provinces have AIS that could eventually make their way to Montana, so the problem is never going away," says Lodman. "Cleaning, draining, and drying your boat and gear after every trip is now the new normal."

▶ *For more on inspection station hours and locations, visit cleandraindrymt.com.*

On summer afternoons, boats line up at the Silos Fishing Access Site on Canyon Ferry, where FWP has set up a decontamination station. Because existence of invasive mussels was suspected on the reservoir, state law requires that boats leaving the water be thoroughly cleaned, drained, and dried—and, if necessary, decontaminated—before traveling elsewhere. Zach Crete, with the FWP Aquatic Invasive Species Program, says the department sets up several lanes at the site to accommodate boats requiring different levels of inspection and decontamination. "We try to make the process as fast and efficient as possible while still being sure the inspections are thorough," he says.

Crew members greet boaters coming off the reservoir and explain the inspection process. Most boaters already know the drill. Many clean off all vegetation and mud, drain their livewell and transom, and dry their boat and motor before arrival. This speeds up the inspection and gets them back on the road.

Daryl Miller (center), Reid Smith (right), and other crew members wait for an owner to lower his motor for inspection.

A couple from Billings watches an inspector open the hatch of their jet ski to flush out the bilge with hot water.

Inspectors attach seals to boat hitches, certifying that the vessel has been inspected. If unbroken, the seals also indicate to FWP game wardens and other officials that the boat has not entered any water since inspection.

CLEAN. DRAIN. DRY.
CleanDrainDryMT.com

Reid Smith flushes hot water through a motor to kill any invasive species in the cooling system. The water enters through "earmuffs" attached to the lower unit. Water temperatures vary from 120 to 140 degrees Fahrenheit depending on what is being flushed.

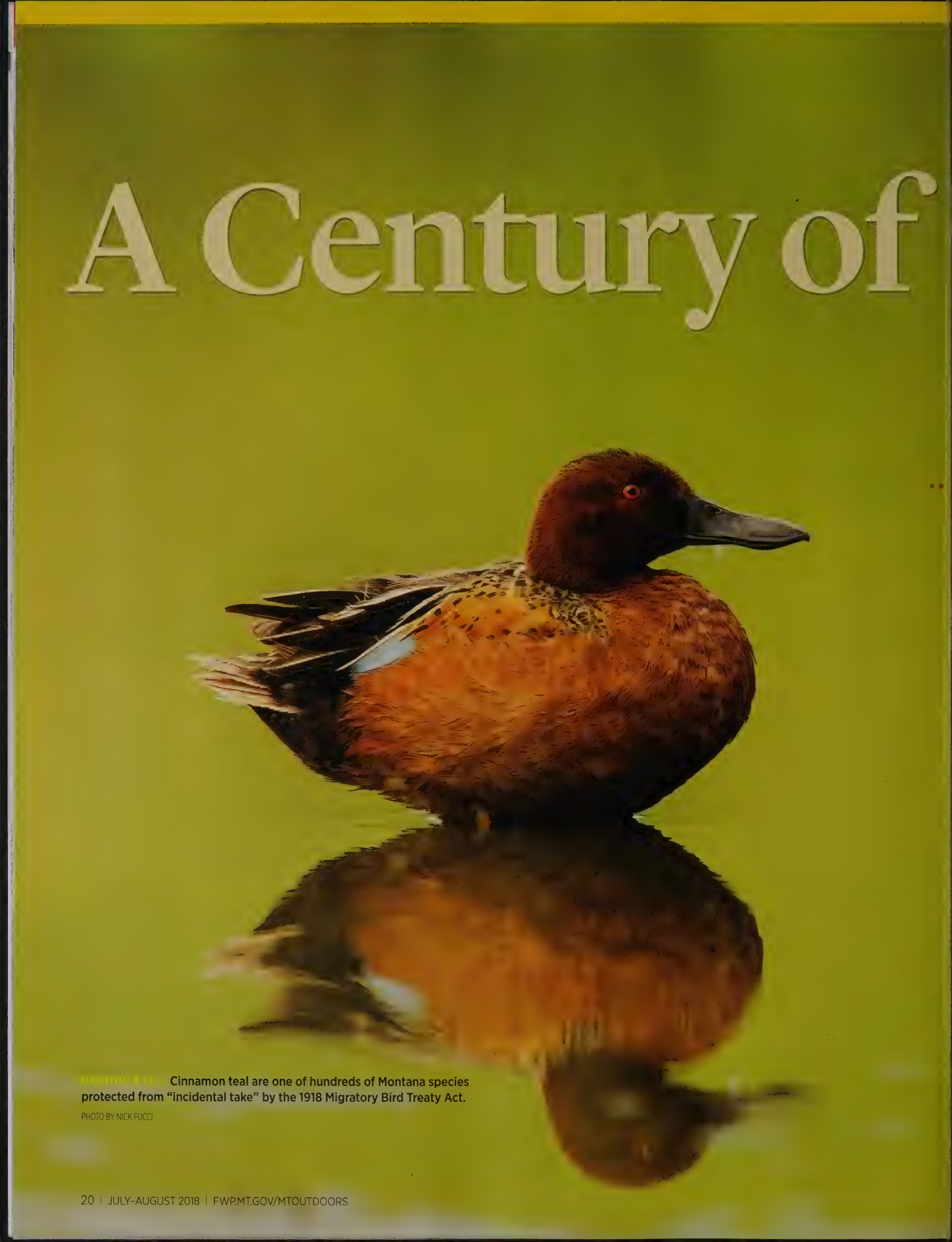
The crew takes a quick break in the shade before more boaters arrive for inspection. The busiest times at inspections stations are weekends and holidays, especially afternoons. FWP operates station throughout the day in case boaters come off the water early and require inspection.

Tom Dickson is editor of *Montana Outdoors*. John Warner is a freelance photojournalist in Billings.

Reid Smith and Kathi Montgomery wrap up an inspection by going through a detailed checklist to ensure that every part of the boat, motor, and trailer has been examined and cleaned. Inspectors even check anchors, anchor lines, life jackets, livewells, and any other places that could be damp or wet and contain invasives.

Natalie Abbott gives some Montana love to a patient passenger. "Our inspectors understand that people—and their pets—just want to get home after a day on the water," says Zach Crete, an AIS Program official. "They appreciate that boaters understand how important inspections are for protecting Montana's waters."

A Century of



Cinnamon teal are one of hundreds of Montana species protected from "incidental take" by the 1918 Migratory Bird Treaty Act.

PHOTO BY NICK FUCCI

Saving Birds

Since 1918, the Migratory Bird Treaty Act has protected winged wildlife from wanton destruction. A new legal opinion could weaken it.

For centuries, people made hats out of wildlife parts—mainly wolf, raccoon, and beaver pelts—with little regard for wildlife conservation. That indifference ended when a fashion boom in women's hats adorned with wild bird feathers and skins ignited a public uproar that produced one of the nation's first wildlife laws.

The outcry began in the drawing rooms of Boston. In 1896, Harriet Hemenway and her cousin Minna Hall learned that populations of snowy egrets, great egrets, and other bird species were being decimated for the millinery trade. Women were increasingly wearing hats adorned with feathers and wings of the egrets' brilliant white plumage, or the colored pelts of woodpeckers, bluebirds, herons, and even hummingbirds. The two socialites were shocked to learn that hundreds of thousands of egrets and other species were being slaughtered each year for the plume trade in the United States and Europe.

Hemenway convinced her cousin to help host tea parties to convince women to denounce feathered headwear. Eventually 900 women in Boston agreed and were joined by several prominent ornithologists. The resulting bird hat boycott culminated in formation of the Massachusetts Audubon Society, other state Audubon groups, and eventually the National Audubon Society.

While the Boston conservationists fought to end the slaughter of birds for fashion, Winchester Repeating Arms became concerned about the dramatic decline of game birds and mammals across the country, not only from market hunting but also habitat loss. Recognizing the ramifications on gun and ammunition sales, Winchester pledged financial support and industry influence to conserve populations of huntable species. Conservation leaders such as William T. Hornady, director of the New York Zoological Park, and George Bird Grinnell, of the newly formed Boone and Crockett Club, joined the movement. They, Audubon members, and others helped pass the Weeks-McLean Migratory Bird Act, which, by banning spring bird shooting, effectively eliminated the plume trade. It was signed by President Taft in 1913.

BAD FORM The craze for feathered hats at the turn of the 20th century fueled a slaughter of egrets and other birds that alarmed many Americans.

PHOTOS: LIBRARY OF CONGRESS

Market hunters, hatmakers, and states' rights advocates sought to weaken the legislation, which even supporters acknowledged was built on shaky constitutional ground. To strengthen the bill, Senator Elihu Root, former secretary of state under President Theodore Roosevelt, suggested turning it into a treaty with Canada. In 1916, motivated by fears that several species might follow the passenger pigeon, Carolina parakeet, and Labrador duck into extinction, the United States entered into the Migratory Bird Treaty with Great Britain, representing Canada, to protect birds from wanton killing.

SUPREME COURT RULES

Opponents of federal bird protection weren't giving up, however. Missouri's attorney general arranged to have himself arrested by a federal enforcement officer

GONE FOR GOOD Three migratory bird species that became extinct around the turn of the 20th century. From left to right: passenger pigeon, Carolina parakeet, and Labrador duck. Congress passed the 1918 Migratory Bird Treaty Act to ensure that such losses never happened again.

for intentionally shooting ducks out of season. The ensuing standoff reached the U.S. Supreme Court. The justices ruled in favor of the warden, in effect granting the federal government supremacy over states in conserving migratory birds. "We see nothing in the Constitution that compels the government to sit by while a food supply is being cut off and the protectors of our forests and crops are destroyed," wrote Associate Justice Oliver Wendell Holmes. "It is not sufficient to rely upon the states...We are of the opinion that the treaty and statute must be upheld."

In 1918, Congress enacted the Migratory Bird Treaty Act (MBTA) to codify the treaty. The act makes it illegal for anyone "to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to Federal regulations." The MBTA accomplished a number of conservation firsts, including banning the sale of game birds, outlawing night shooting, and protecting all species used in the plume trade. It also established exceptions for the regulated hunting of game birds. By the early 1920s, both hunters and birders reported significant increases in migratory populations.

The MBTA has since been broadened—through treaties with Mexico (1936), Japan (1972), and the Soviet Union (now Russia, 1976)—and with amendments that protect eagles, owls, hawks, and other raptors. The act is credited with saving egrets, wood ducks, sandhill cranes, and other species from extinction. It continues to protect more than 1,000 species in the United States. Until recently (see "Interior Department grounds the MBTA," page 27), every U.S. administration since the 1970s has held that the act strictly prohibits the unregulated killing of birds. Since enactment, according to the National Audubon Society, the MBTA has saved millions, if not billions, of birds.

> "The MBTA helps ensure that these birds are protected at a national and international scale, so that one state or one country doesn't jeopardize a resource that doesn't know political boundaries."

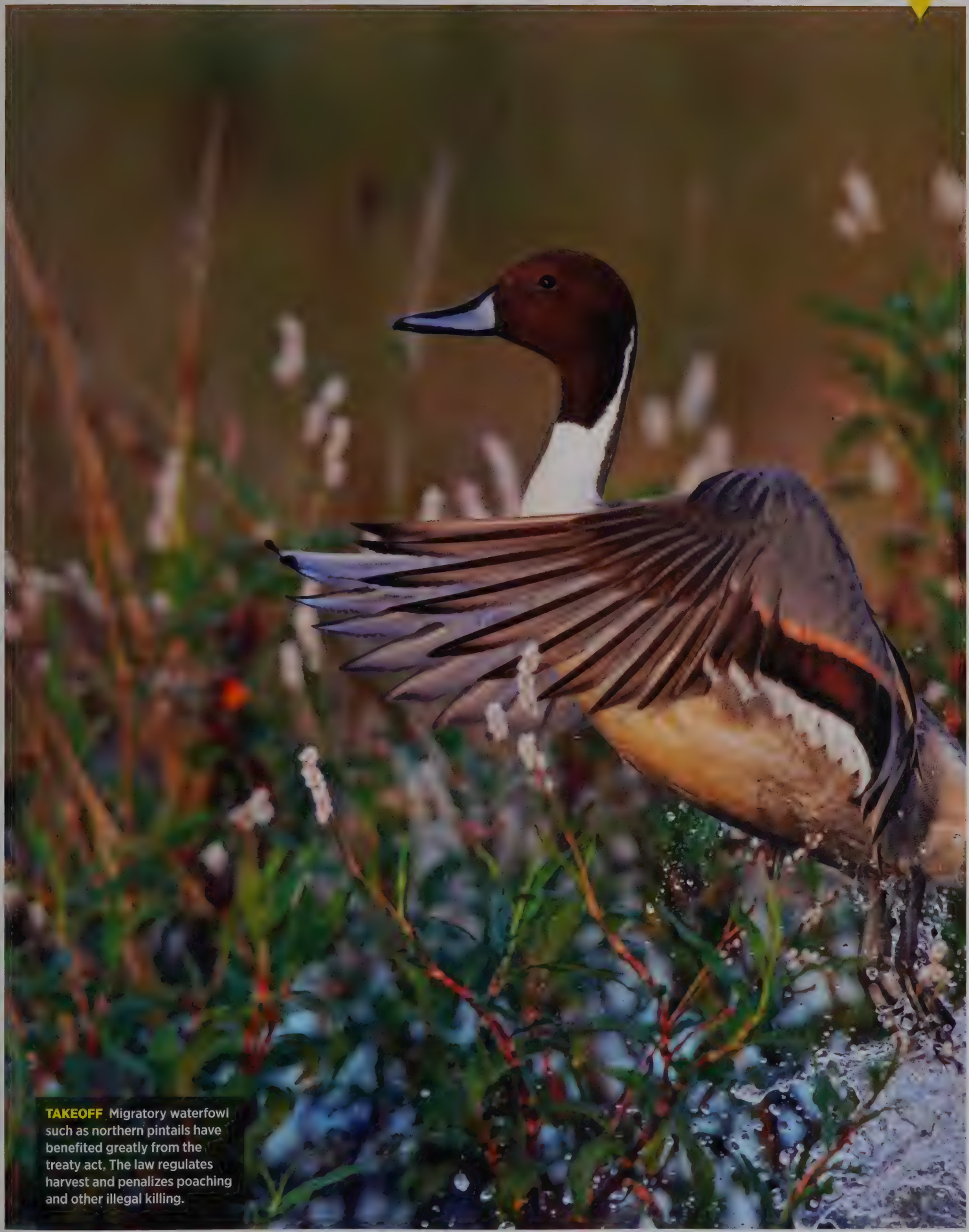
The National Geographic Society, National Audubon, Cornell Laboratory of Ornithology, and dozens of other conservation and scientific organizations declared 2018 the Year of the Bird to highlight the 100-year-old act.

MONTANA BENEFITS

The MBTA has been a lifesaver for Montana birds, say state wildlife officials. Abundant wetlands and grasslands in the state's north-central and northwestern regions combine to produce more waterfowl than any state except Alaska, North Dakota, and South Dakota. Ken McDonald, head of the Montana Fish, Wildlife & Parks Wildlife Division, says federal agencies have long

CONTINENTAL TRAVELERS Montana is in both the Central and Pacific Flyways. Many "Montana" bird species winter in Central America or nest in Canada or Alaska.

Missoula writer PJ DelHomme is an editor at Bugle.



TAKEOFF Migratory waterfowl such as northern pintails have benefited greatly from the treaty act. The law regulates harvest and penalizes poaching and other illegal killing.

PAINTINGS BY JOHN JAMES AUDUBON; FLYWAY MAP USFWS; NORTHERN PINTAIL GARY KRAMER

STILL VULNERABLE The decimation of shorebirds, waders, and other species for the hat trade inspired the MBTA a century ago. The long-legged water-loving birds—such as egrets, herons, and Wilson's phalaropes (shown here at Freezout Lake)—still need protection, especially from oil spills, oil waste pits, power lines, and wind turbines.

PHOTO BY CRAIG TUZLAR/COM

SAFETY NET Montana birds covered by the Migratory Bird Treaty Act include, clockwise from top left, the yellow-rumped warbler, rough-legged hawk, western meadowlark, and redpoll. Many species—including Montana's state bird, the western meadowlark—travel across North America. Because the act protects on a continental scale, it ensures that no one state, province, or country can put at risk species that traverse political boundaries.

CLOCKWISE FROM TOP LEFT: WES UNCAPHER; ED COYLE; BOB MARTINKA; JEFF VAN TINE

used the MBTA to protect waterfowl and prosecute poachers. "Montana ducks and geese have definitely benefited," he says. So have other migratory birds. For instance, the MBTA inspired the Montana Electric Co-op Association to develop a bird protection plan to reduce deaths of hawks and songbirds at power lines and electric facilities.

McDonald notes that many "Montana" birds spend only part of the year in the state, often nesting in Canada or Alaska or wintering in Central America. "The MBTA helps ensure that these birds are protected at a national and international scale, so that one state or one country doesn't jeopardize a resource that doesn't know political boundaries," he says.

Not only does the MBTA protect Montana waterfowl, raptors, and songbirds, it benefits the many residents and visitors who hunt ducks and geese and enjoy watching birds. According to the U.S. Fish & Wildlife Service, Montana is home to more wildlife watchers per capita than any other state. "The people who came together to save birds 100 years ago recognized how important migratory birds are to the world we live in," McDonald says. "We owe them our gratitude—and a commitment to keep working to protect birds."

Birders watch migratory snow geese at Freezout Lake Wildlife Management Area.

Interior Department grounds the MBTA

On its 100-year anniversary, the Migratory Bird Treaty Act (MBTA) had its wings clipped.

In December 2017, the Department of the Interior solicitor's office abruptly issued a legal opinion stating that any incidental take of migratory birds was not a violation of the act. An "incidental take" is a death caused by otherwise lawful activities. "The change means that only intentional killing—like illegally hunting or trapping migratory birds—will be enforced," says Martha Williams, Montana Fish, Wildlife & Parks director, previously a Department of Interior attorney. "To our great disappointment, it now appears that the often-preventable deaths of birds killed by power lines, communications towers, oil pits, oil spills, and wind farms will no longer violate the law."

In April 2018, the Department of the Interior issued a legal memorandum to the U.S. Fish & Wildlife Service to provide additional information on the December opinion. The memo said the MBTA can no longer be used to prosecute companies or others if the "underlying purpose of that activity is not to take birds." For instance, if migratory birds die after landing in an uncovered oil drilling waste pit or are killed by wind turbines, that would no longer be a prosecutable offense.

Under a recent interpretation of the Migratory Bird Treaty Act, bird injuries and deaths caused by oil spills will no longer violate the law.

The April memo reads, "The department has pursued MBTA claims against companies responsible for oil spills that incidentally killed or injured migratory birds. That avenue is no longer available." To limit incidental take, many oil, electric, and other companies work with conservation groups and wildlife agencies to protect birds, often using methods such as placing nets over oil ponds or installing markers on power lines. Without the threat of penalties, companies may be less inclined to spend the time and money required to do what's right for wildlife. "This shift in policy is troubling," Williams says. "Some energy companies are very proactive about protecting birds, and this change will serve as a huge disincentive for them to continue being proactive."

According to the National Audubon Society, power lines kill up to 64 million birds per year nationwide, and 500,000 to 1 million birds perish in oil waste pits.

In May, National Audubon, the National Wildlife Federation, and several other organizations sued the Interior Department over the new opinion. In addition, 17 former Interior officials, including U.S. Fish & Wildlife directors under presidents Richard Nixon, George H.W. Bush, Bill Clinton, George W. Bush, and Barack Obama repudiated the reinterpretation. The signatories called on Department of the Interior Secretary Ryan Zinke to "suspend this ill-conceived opinion, and convene a bipartisan group of experts to recommend a consensus and sensible path forward."

—Tom Dickson, Editor

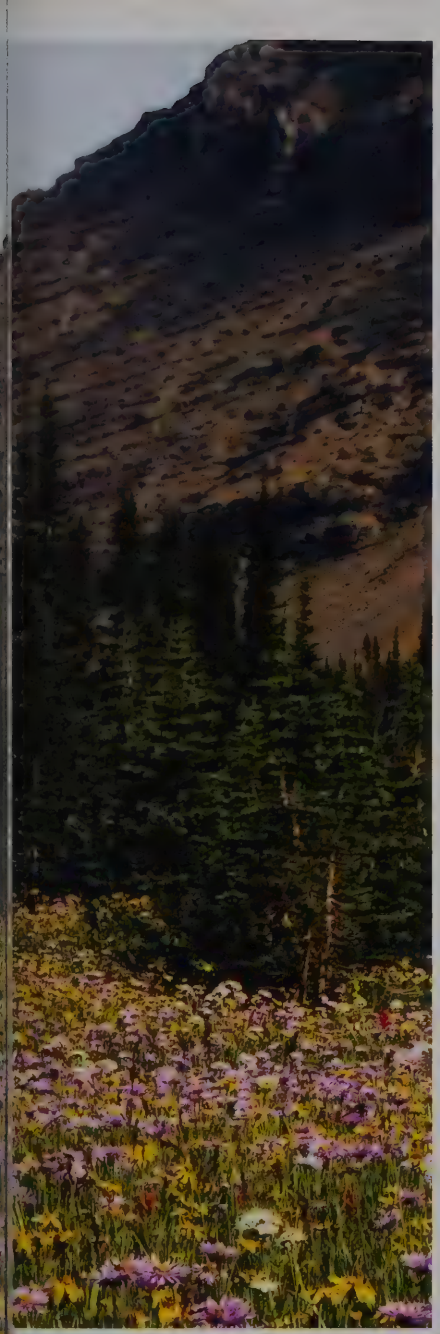
TOP TO BOTTOM: JAY L. CROSS; COURTNEY SPRADLIN/LOG CABIN DEMOCRAT

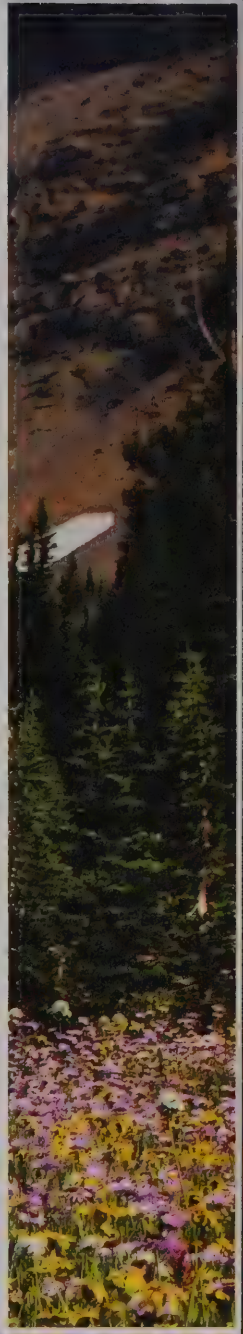
OUT IN IT Above left: Hikers wade through wildflowers on Glacier National Park's Piegan Pass Trail, part of the Continental Divide Trail system. At right: Montana contains more than 22,000 miles of equestrian, snowshoeing, mountain biking, hiking, cross-country skiing, and off-highway vehicle trails.

CONNECTING PEOPLE TO GREAT PLACES

For the past 50 years, the National Trail System Act has created a network of trails across the United States. Those and locally created routes in Montana benefit communities, residents, and visitors.

BY TOM DICKSON





When Kathy Schoendoerfer and her fishing guide husband Travis opened a fly shop in Ovando in 2000, the town's economy looked grim. "People here were saying Ovando was about to dry up and blow away," she says. But today the town of 75 is booming, at least during the summer, thanks to the roughly 1,000 bicyclists who stop by while riding the Great Divide Mountain Bike Route or Lewis and Clark Bicycle Trail on nearby U.S. Highway 200.

Cyclists can now camp for free in the town park; pay $5 per night to stay in a tepee, the original town jail, or a sheepherder's wagon; or splurge on a real bed at the 100-year-old Ovando Inn. Also available: toilets, showers, laundry, two cafes, a grocery store, and a travelers' message board. "We're now known from Banff to Belgium as a Montana destination," Schoendoerfer says of Ovando, named the Montana Office of Tourism and Business Development's 2018 Community of the Year (the smallest town ever to receive the honor). "Cyclists breathed life into Ovando. We would have been crazy not to do everything we could to welcome them here."

A 2014 University of Montana study found that bicycle tourists contributed nearly $377 million annually to Montana's economy. That's no surprise to merchants in Twin Bridges. For years, cyclists traversing the TransAmerica and Lewis and Clark Bicycle Trails blew right through town,

D. LYNELL BLANK; INSET PHOTOS BY SHUTTERSTOCK.

BUCKS FROM BIKES Small communities like Ovando (left) and Twin Bridges (above) lure cyclists by offering camping, showers, food, and other essentials. "If you're on a bike, you rely on the small communities that people in vehicles drive right through," says one bicycle touring advocate.

population 400. Then, in 2009, local resident Bill White got the okay to build a cyclists-only campground in the town park. The two-wheeled tourists began stopping—and spending. "All the bike riders passing through were like gold going by in a river," White, who died in 2012, told a *Montana Quarterly* reporter in 2010. What's now known as Bike Camp offers showers, toilets, a screened eating area, and grass to pitch a tent. "A group might spend a couple hundred dollars over a day or two," says Roger Hutchinson, owner of the Main Street Market. Town leaders estimate the camp attracts roughly $10,000 in new business each year.

Cyclists aren't the only trail users fueling local economies. Hikers, backpackers, horse riders, snowmobilers, and others spend millions of dollars annually to experience Montana's world-renowned scenery, open space, and wildlife. All that visitation wouldn't happen without designated routes. "Trails are essential to Montana's entire recreation economy," says Bob Walker, chair of the Montana Trails Coalition. "They take people to places in Montana they could never see or experience if they stayed on the interstate."

Trail use is increasing in Montana and nationwide, fueled in part by growing visitation to trail-rich national parks (Glacier continues to break attendance records every year), the aging population's desire for low-impact exercise, and the 2014 movie *Wild*, a story of self-discovery on the Pacific Crest Trail starring Reese Witherspoon.

In 1968, Congress passed the National Trails System Act to meet increasing demand for scenic and recreational routes. Today, on the act's 50th anniversary, communities, residents, and visitors across Montana recognize the value of trails to local economies and quality of life. "The act was what started federal involvement in trail designation," says Beth Shumate, head of the Parks Division of Montana Fish, Wildlife & Parks. "From that we've seen an amazing growth not only in national trails but also state and community trails that provide recreation and health benefits for Montana residents and visitors."

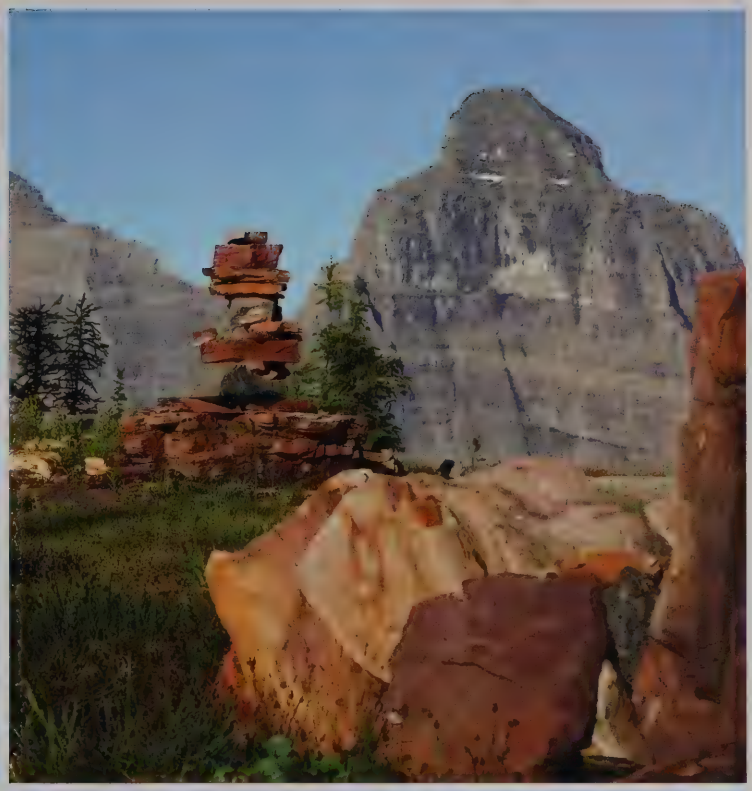
"Trails are essential to Montana's entire recreation economy. They take people to places to see and experience things in Montana they never could if they stayed on the interstate."

CONGRESS TAKES A BIG STEP

Trails have crisscrossed North America for as long as animals and people needed to move from one place to another. The first, created by wildlife, were expanded by American Indians, fur trappers, and settlers. The United States didn't get serious about trails until the post-World War II recreation boom of the 1950s and '60s. Possessing more free time and spending money, Americans wanted more opportunities to enjoy the outdoors. The 1968 National Trails System Act was designed "to promote the preservation of, public access to, travel within, and enjoyment and appreciation of the open-air, outdoor areas and historic resources of the nation." Initially, Congress authorized creation of National Scenic and National Recreation Trails. It amended the act in 1978 to add National Historic Trails, like the Nez Perce National Historic Trail from Idaho to north-central Montana.

The nation's 11 National Scenic Trails, like the Continental Divide Trail from southern New Mexico to Glacier National Park's northern boundary, each are 100 or more miles long and designated mainly for nonmotorized use. The 19 National Historic Trails follow travel routes of national significance, such as the Lewis and Clark Trail that connects 11 states. The roughly 1,200 National Recreation Trails are shorter. In Montana, these range from the 32-mile-long Garnet Winter National Recreation Trail south of the Blackfoot

CLOCKWISE FROM TOP LEFT: FAR OUT WANDERINGS; CRYSTAL BAE; STEVEN AKRE; NELSON KENTER; CHUCK HANEY; JOHN LAMBING



DECISION POINT
The Lewis and Clark expedition camped at the confluence of the Marias and the Missouri Rivers between June 10, 1805. The long days allowed the group to explore and contemplate. Believing the Great Falls described by the Mandan Indians information provided by the Mandans the previous winter had been reliable to this point. But finding the Marias River was a surprise. The correct decision would lead the expedition to the best route across the Rockies. A wrong decision could strand them unprepared for a potentially deadly winter. Lewis led a small party up the Marias. Clark did the same along the Missouri but turned around just short of the falls. Their decision was a judgment call. The Marias was swollen and muddy from spring runoff. The Missouri was clear with a rocky bed, characteristic of rivers recently emerging from the mountains. The captains were confident the Missouri was the correct route, and their decision was rewarded when the falls were discovered on June 13, 1805.

NATIONAL TRAILS Montana is home to several renowned national trails (see map on page 32). Clockwise from top left: Trail marker on the Continental Divide National Scenic Trail; a rock cairn on the Pacific Northwest National Scenic Trail; a marker commemorating Chief Joseph at Bear Paw National Battlefield on the Nez Perce National Historic Trail; Decision Point above the confluence of the Missouri and Marias Rivers, on the Lewis and Clark National Historic Trail.

River, which is used by snowmobilers, cross-country skiers, and dogsledders, to the half-mile-long Prairie-Marsh Boardwalk, a wheelchair-accessible trail at Benton Lake National Wildlife Refuge north of Great Falls.

In 1983 Congress amended the National Trails System Act to allow unused rail corridors to be converted to trails. Montana now has 19 rail-trails totaling 228 miles, including the Route of the Hiawatha Scenic Bike Trail near Lookout Pass along the Idaho border.

ECONOMIC DRIVERS

Whether taking snowmobilers to scenic winter vistas, allowing backpackers to explore wilderness, or providing places to walk the dog, trails provide endless health and recreation benefits. They also foster local community pride and identity, generate spending, and create jobs.

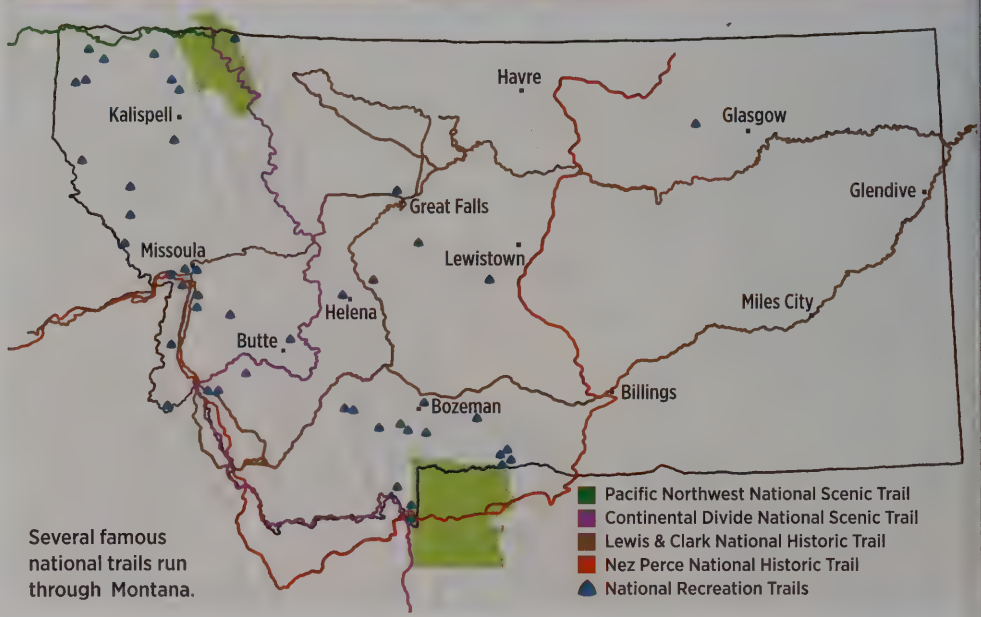
The Whitefish Trail covers 36 miles of natural surface around Whitefish Lake in northwestern Montana. A recent study by Bozeman-based Headwaters Economics found that hikers and mountain bikers using the trail system contribute $6.4 million annually and support 68 additional jobs in Whitefish. "Outdoor recreation is the number one reason people live in or visit Whitefish," says study author Megan Lawson. "The Whitefish Trail is a huge part of that attraction."

Laura Crawford of the Missoula-based Adventure Cycling Association says small communities are especially positioned to reap a steady cash flow from cyclists. "For a 200-mile trip between, say, Kalispell and Helena, a family in a vehicle might stop once for gas and maybe lunch," she explains. "But cyclists biking 50 miles a day need four days of food, and places to sleep, preferably with a hot shower, in four different towns. If you're on a bike, you rely on the small communities that people otherwise drive right through."

Towns like Seeley Lake, Cooke City, and Troy benefit from motorized trail use, too. A University of Montana study in the early 2000s found that nonresident snowmobilers, using the Treasure State's 4,000 miles of groomed trails, spent an average of $224 per day in the state, for a total of $44 million annually.

Trails make communities more livable and add value to real estate. "The hospital, large manufacturers, and other businesses are attracting workers to Lewistown in part because we offer a trail system that people want," says Kevin Myhre, development director for a construction company and for 14 years the Lewistown city manager. "We've now got a brewery that wants to locate right next to a trail here in town." A $2 million

National trails in Montana



Several famous national trails run through Montana.

The great upkeep challenge

"Every community wants to build a new trail, but they also need to make sure there's money for operations and maintenance down the road," says Beth Shumate, head of the FWP Parks Division.

Trails require upkeep. Signs defaced by vandals need replacement. Routes must be cleared when blocked by rock slides, vegetation, and fallen trees. For instance, large stretches of the Continental Divide Trail need work to open up blockages created by wind-blown trees killed by pine bark beetles or forest fire.

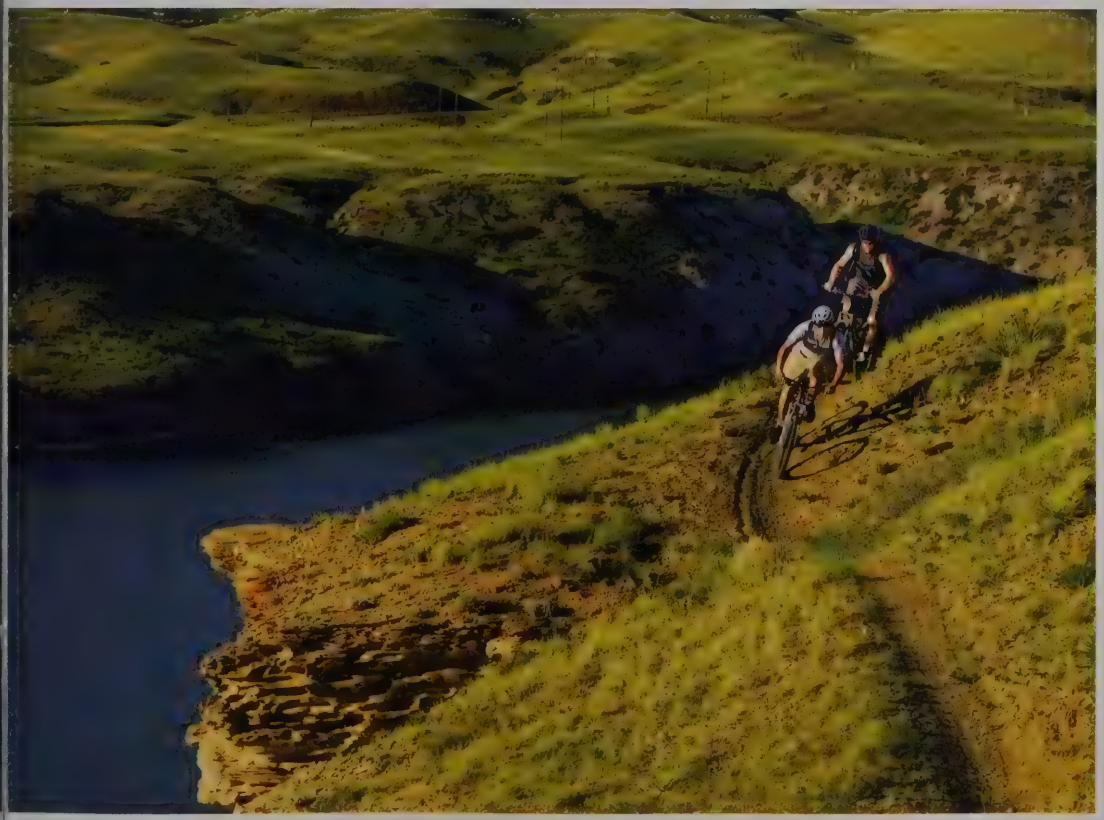
MWA crews reroute a trail in a burned forest.

To the rescue are volunteers who adopt trails and clear trees, shore up eroding routes, and do other maintenance. Among many other volunteer efforts statewide, the Montana Wilderness Association is working with the Continental Divide Trail Coalition this summer to repair areas of the national trail near Lewis and Clark Pass damaged by the 2017 Alice Creek Fire. Equestrians and OHV users keep trails clear, too.

Funding remains inadequate to meet the growing backlog of neglected trails. "Even though communities are asking for more trails, federal agencies are seeing huge budget cuts for trail development and management," says Bob Walker, chair of the Montana Trails Coalition. "We need to restore that funding and find new sources of revenue to maintain the trails that people want here in Montana." ■

CLOCKWISE FROM TOP LEFT: LUKE DURAN/*MONTANA OUTDOORS*; KEN TAKATA; CHUCK HANEY; MONTANA WILDERNESS ASSOCIATION

WINTER AND SUMMER Above: Pausing to take in the scenery on Two Top Mountain Snowmobile Trail near West Yellowstone. Below: Mountain biking a spur of the River's Edge Trail in Great Falls.



The National Trails System Act was signed into law by President Lyndon Johnson in 1968

National Scenic and Historic Trails

11 National Scenic Trails

19 National Historic Trails

▲

These 30 trails run 55,000 miles through 49 states in wild, rural, suburban,and urban areas.

▲

They connect and travel through 70 wildlife refuges, 80 national parks, 90 national forests, 100 Bureau of Land Management areas, 120 wilderness areas, numerous state and local parks, trails, other protected areas, and 100 major urban areas.

▲

It takes over 1 million hours of volunteer labor to build and maintain these trails each year.

National Recreation Trails

1,200 trails, including 21 National Water Trails

▲

26,000 miles

▲

These trails run through all 50 states, the District of Columbia, and Puerto Rico.

Rail-Trails

A 1983 amendment to the National Trails System Act allows unused rail corridors to be converted to trails.

▲

2,000 rail-trails exist in 50 states.

▲

As of 2017, there were 22,000 miles of completed rail-trails and 8,000 miles of projects in progress.

FROM BACKCOUNTRY TO FRONTCOUNTRY Above: Backpackers hike through a sea of fireweed in a burned section of the Continental Divide Trail deep in the Bob Marshall Wilderness Area. Left: Hunters rely on trails to penetrate deep into forests to find elk, deer, and other big game. Right: Just a few miles from bustling U.S. Highway 93 in the Bitterroot Valley, a ranger leads a bird-watching group on the Kenai Nature Trail in the Lee Metcalf National Wildlife Refuge.

home in the Spanish Peaks listed by Big Sky Real Estate boasts that the house is "just steps away" from hiking, cross-country skiing, and mountain biking trails.

You don't need to be a millionaire to enjoy the hundreds of national, state, and local trails totaling 22,000 miles in Montana. The majority—roughly 85 percent—run through national forest property managed by the U.S. Forest Service in Montana's western half. But central and eastern Montana have trails, too, often built by towns and cities working with state and federal agencies and civic-minded landowners. Billings-area residents use the Swords Rimrock Trail overlooking downtown or head south on weekends to the Pryor Mountain's motorized and nonmotorized trails. After the flood of 2011, Roundup constructed two miles of trail along the scenic Musselshell River used by residents and tourists. Lewistown's extensive trail system includes access to one of the most productive wild trout streams in Montana.

Other notable routes through Montana include the Ice Age Floods National Geologic Trail, and water routes like the Clearwater River Canoe and the Flathead Lake Marine Trails. Some trails are designated by private groups like Adventure Cycling, which mapped and promotes the Great Divide Mountain Bike Route from Alberta through Montana to New Mexico. Others, like the Bitterroot Birding Trail and Montana Dinosaur Trail, are not physical trails but conceptual routes connecting a series of specialized recreation sites, in this case for bird watching and amateur paleontology.

Add to that the hundreds of miles of equestrian, snowmobile, and off-highway vehicle trails, and thousands of miles of mountain and streamside trails used by hunters and anglers to find game and reach fishing waters.

CLOCKWISE FROM TOP LEFT: NELSON KENTER; STEVEN AKRE; DENVER BRYAN

FUNDING TRAILS

Uncle Sam funds almost all trail development and maintenance. In 1992 Congress established the Recreational Trails Program, which provides funds to states to develop and maintain nonmotorized and motorized recreational trails and trail-related facilities. The money comes from an excise tax on motor fuel used by snowmobiles, all-terrain vehicles, off-highway motorcycles, and off-highway light trucks. (Hikers: Consider hugging an OHVer one of these days in gratitude.)

In Montana, the federal money is administered by the FWP Parks Division's Recreational Trails Program, which makes grants to public agencies, communities, tribes, counties, nonprofit groups, and other entities. FWP collaborates with the citizen-based State Trails Advisory Committee to review applicants and award grants each year.

In 2018, FWP granted roughly $1.5 million in federal money to 50 recipients including $20,000 to Pondera HealthCare Foundation to build a mile-long multiuse path at Conrad; $10,000 to the Troy Snowmobile Club to groom trails in the Kootenai National Forest; $85,000 to avalanche education centers in Missoula and Hungry Horse; and $90,000 to the Back Country Horsemen of Montana to improve multiuse trails across western Montana. "Based on project proposals, we've seen interest in trails in Montana double in the past decade," says Shumate, the FWP Parks Division administrator. "Every community we hear from wants a trail system that connects people to public lands and outdoor recreation."

Shumate adds that FWP and other Montana agencies are helping small towns develop trail systems through the state's Building Active Communities project. "Small communities definitely get it," she says. "They see that trails are all about livability, that they bring people together and strengthen the social fabric—not to mention draw money into the local economy."

Trails, trail groups, and other information

A wide variety of books and websites offer information on federal, state, and local trails across Montana.

Trails

National Trails: Locations of all National Historic Trails, National Scenic Trails, and National Recreation Trails in Montana are on the "Find Trails" page of the American Trails website (americantrails.org).

Montana Hiking Trails: FalconGuides publishes guidebooks on Montana hiking and backpacking that are useful for both beginners and experts.

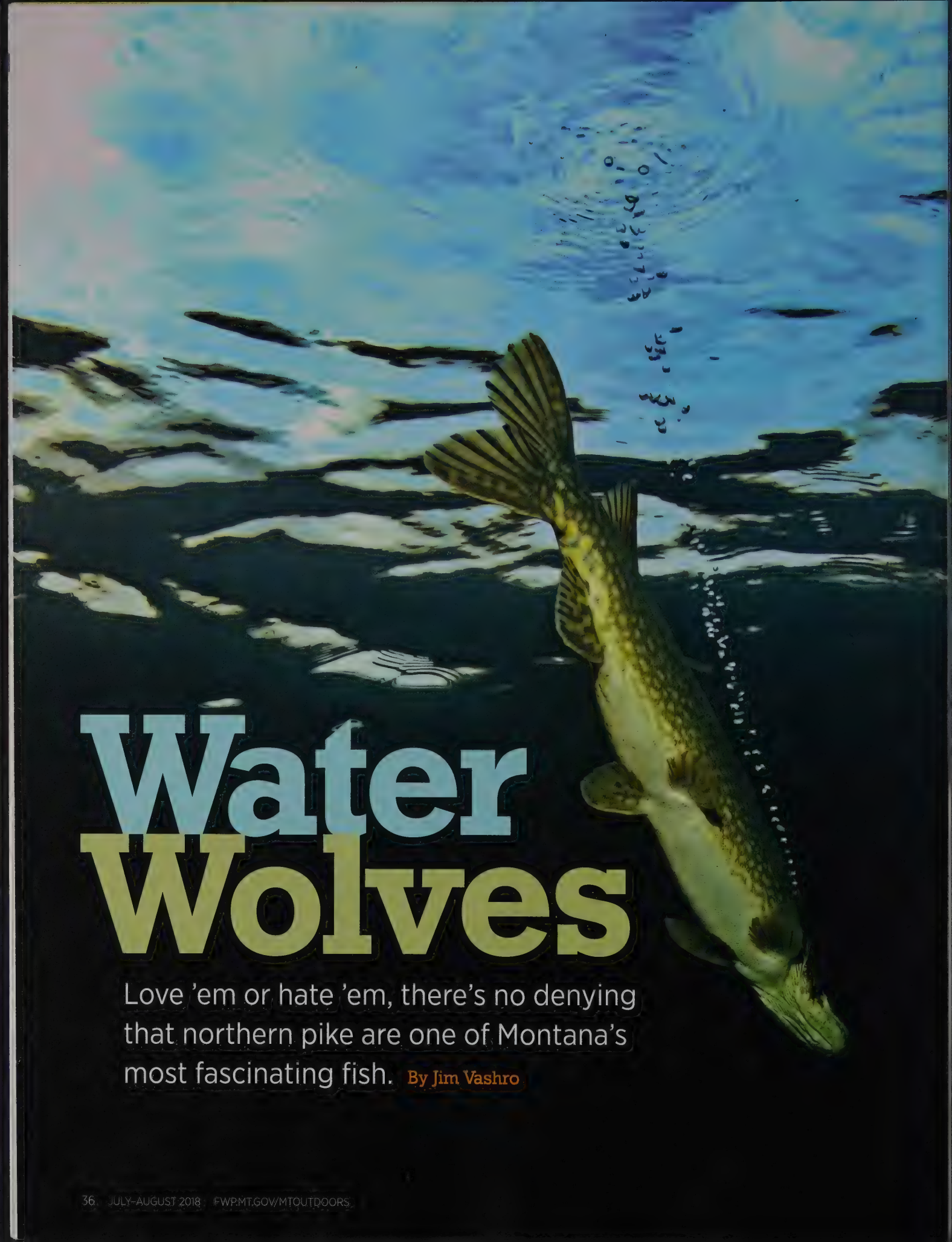
Maps: Find trail maps, including detailed U.S. Geological Survey topographic maps (essential for backcountry travel), at sporting goods stores and online.

Organizations

FWP Recreational Trails Program: Learn how to apply for grants and see where federal funds are distributed in Montana. Program information is on the FWP website: fwp.mt.gov. There you can also search for the comprehensive (though nearly two-decades-old) Montana State Trails Plan.

American Trails: This national group advocates for all types of motorized and nonmotorized trails. The organization's website (americantrails.org) has a Montana page listing dozens of links to trail information and advocacy groups.

Montana Trails Coalition: This new organization brings together a wide range of trail interests—from snowmobilers to the Montana Wilderness Association—who share a common goal of creating new trails in the backcountry, in the frontcountry, and between communities, and maintaining existing trails. Supported by an advisory committee of state and federal agencies, the group aims "to find alternative funding sources to manage trails," says group chair Bob Walker. Learn more at montanatrailscoalition.org.



Water Wolves

Love 'em or hate 'em, there's no denying that northern pike are one of Montana's most fascinating fish. By Jim Vashro

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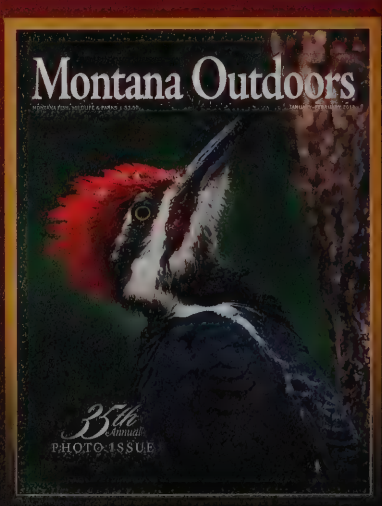

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Anglers have given the northern pike many nicknames—jackfish, hammer handle, slough shark, northern, and slimer (for the mucus covering its scales). Some also call it water wolf. As is the case with the terrestrial wolf, *Esox lucius* often inspires strong feelings—anglers either love the fish or hate it. Also like its furry namesake, this large predator is surrounded by myths and controversy.

Northern pike exist in Russia, Europe, North America, and elsewhere across the Northern Hemisphere. The ancient species dates back 80 million years to the reign of dinosaurs. Superbly adapted to their environment, modern pike show little change from early fossils.

Their distinctive elongated shape and mottled olive green-and-white coloration are ideal for waiting in vegetation to ambush prey fish. Their elongated flat head gives them a sinister look. Large specimens are often called "gators" for their resemblance to the large reptiles and a reputation for ferocity.

In North America, northern pike are found in 26 states and six Canadian provinces. The species belongs to the Esocidae family, which also includes muskellunge and three species of pickerel. The tiger muskie is a sterile hybrid of a female muskie and male northern pike.

Pike spawn when water temperature reaches 48 degrees, shortly after ice-out. Several males and a female thrash in the shallows while she expels sticky eggs over submerged vegetation. A female produces an average of 30,000 eggs—a prodigious output necessary because only a tiny fraction of eggs and larval fish survive. Pike fry first eat microscopic zooplankton, then aquatic insects. When the young reach three to four inches long, they start to eat small minnows. By the time a pike is a foot long, its diet consists almost entirely of fish.

Pike grow fairly rapidly, reaching 20 inches by age three or four and 30 inches by age seven or eight. They can live more than 10 years. But because they so willingly take lures, under even moderate fishing pressure most are harvested for their white, flaky meat before reaching advanced age.

A northern pike is an extremely effective predator. The camouflaged fish rests motionless for hours in vegetation waiting for a smaller fish to pass within striking distance. Its dorsal fin, which on most fish species is in the middle of the body, sits back near the deeply forked tail. When prey nears, the pike bends its body into an S shape. Then it launches at 10 to 15 feet per second, propelled by its large fins. At the last moment its massive jaws and gills flare open, creating a vacuum that sucks the hapless victim into rows of several hundred razor-sharp, backward-pointing teeth. The pike strikes the side of its prey, then maneuvers the smaller fish head-first to swallow whole.

ARMFUL Lance Moyer with the 37.5-pound state record northern pike he caught in 1972 at Tongue River Reservoir. Pike rarely top 30 pounds these days because so many mid-sized fish (5 to 15 pounds) are kept for their meat.

Pike are a coolwater species, preferring temperatures between 60 and 70 degrees. They usually swim in shallow, weedy water, though larger pike seek out cooler, deeper holes as water warms in summer. The largest pike caught in Montana was a 37.5-pounder from Tongue River Reservoir in 1972. A few pike over 30 pounds are caught each year, but those have become increasingly rare as angling pressure increases on this popular sport fish.

ESOX FABLES

Like predator species of all types, pike have long inspired fables and myths. The so-called "Emperor's Pike," a skeleton that appeared in Germany in 1497, was 19 feet long and reputedly belonged to a fish weighing 550 pounds when alive. An engraved copper ring encircling its ribs indicated it had been caught and released by Emperor Frederick II 267 years earlier. The pike skeleton hung in the Mannheim Cathedral for decades until skeptics proved it was actually made from the bones of several fish glued together.

Jim Vashro retired as FWP regional fisheries manager in Kalispell in 2011.

LEFT TO RIGHT: VIKTOR VRBOVSKY/ENGBRETSON UNDERWATER PHOTOGRAPHY; MONTANA FWP

LET GO TO GROW An angler releases a large pike to swim another day. In spring and early summer, the fish are caught near shore. In hot weather, they move deep to colder water, making them difficult to find and catch.

Pike do get big, but nowhere near that size. The world record is a 55-pound, 1-ounce pike caught in Germany in 1986.

A more modern myth is that pike stop biting in midsummer because they "lose their teeth." Some years ago I spoke with Rod Ramsell, then a fisheries biologist with the Minnesota Department of Natural Resources. He noted that pike constantly lose and replace teeth. But losing all their teeth at one time wouldn't help a fish that lives by chomping other fish. Ramsell told me he had handled about 30,000 northern pike during his career and had never seen one that was toothless.

It's true that pike are tough to catch in summer. That's because young-of-the-year prey fish have grown to ideal eating size, and pike find them far more appealing than anglers' lures. Another reason is that large pike head to deeper, cooler water in midsummer, while anglers often continue fishing the shallows, where they found fish in spring.

One long-enduring myth is that northern pike attack anything that swims, including small dogs and children. Ramsell said he had never been bitten while handling tens of thousands of pike. He knew of only a dozen or so documented cases of a northern pike—or, more likely, the closely related muskellunge—biting someone. In almost every case, the fish grabbed someone's hand or foot as it dangled in the water from a boat or dock or moved in murky water. But those handful of stories have been inflated and persist in newspapers, TV, and social media.

Pike do have dangerous teeth, and wise anglers handle them carefully with jaw spreaders and long-nose pliers.

Yet another pike misconception is that they are "voracious" and will attack lures—and small animals—with wild abandon. I first fished for the species 35 years ago on the Flathead River near Dixon. After hearing about pike in a slough, I hiked downstream to a likely backwater. While watching swallows skimming the surface for insects, I wondered if this was the spot. Suddenly, the water exploded right behind a swallow. I quickly tied on a topwater plug and the pike were...well, in this case they actually were voracious. Over the next several hours I had some of the best fishing of my life, with numerous spectacular hits. I landed about 15 pike that night. Yet after repeatedly fishing for pike over the next 35 years, I've experienced that kind of feeding frenzy only one other time. Usually pike ignore my offering or lazily follow the lure to the boat, then glare at me before drifting away.

Biologists have found that pike occasionally consume small waterfowl and mice (see "Do pike eat ducklings?" on page 39). And they do sometimes aggressively strike prey and fishing lures. I remember one 10-pounder that launched from 10 feet away and hit my surface plug on its downward arc.

But a consistently "voracious" predator? That's rarely been my experience.

A commonly held notion is that pike are gluttonous, eating enormous amounts of prey. Pike have a food conversion rate of 3.5 to 1. That means a 10-pound pike will have eaten about 35 pounds of prey to reach that size. That sounds like a lot, but other piscivores such as walleye or brown trout actually have higher conversion rates of 4.5 to 1. So a 10-pound walleye would have eaten about

LEFT TO RIGHT: PATRICK CLAYTON/ENGBRETSON UNDERWATER PHOTOGRAPHY; STEVEN GNAM; VIRPOOL

45 pounds of prey. That makes sense when you consider that a constantly roaming brown trout or walleye needs far more calories than a lie-in-wait pike.

HARMFUL INTRODUCTIONS

Despite being a tasty and sporting species, pike that are illegally introduced often harm existing fish populations, especially trout and other salmonids. In Montana, pike are native only to several miles of the St. Mary River northeast of Glacier National Park in the South Saskatchewan River drainage. Though FWP stocked pike in some eastern Montana waters several decades ago, the agency has long since discontinued the practice and denounces illegal plantings. To dispel another myth, pike are not spread by their eggs sticking to duck's feet or an osprey dropping a small pike into another water.

Pike are the number one illegally planted fish in Montana, accounting for more than 100 of the nearly 600 documented unauthorized plants statewide. An unauthorized plant in 1953 moved pike from Lake Sherburne in Glacier National Park to Lone Pine Reservoir in western Montana. Some of those pike drifted down the Little Bitterroot River to the Lower Flathead River and Clark Fork drainage. In the late 1960s, some of those pike were illegally put into Echo Lake near Bigfork, from which they rapidly spread to nearly 70 waters in northwestern Montana. Pike now swim in more than 80 waters west of the Continental Divide; all of them are there illegally.

Years ago, pike were illegally planted in a private pond near Gallatin Gateway, then escaped into the Gallatin River and made their way down into the Missouri River. A 34-pound northern pike caught at Canyon Ferry Reservoir in 2017 was likely the result of that illegal planting many miles upstream.

Introduced pike can degrade existing fisheries and take a bite out of important native species. On the Upper and Lower Stillwater Lakes northwest of Whitefish, pike caused declines in westslope cutthroat and bull trout populations. Pike unlawfully dumped into Salmon and Seeley Lakes in the early 1990s spread downstream into the Blackfoot and Clark Fork Rivers, where they feed on brown, rainbow, bull, and cutthroat trout. Before Milltown Dam was removed, biologists would regularly find the stomachs of northern pike in Milltown Reservoir filled with various trout species.

The idea of moving fish is not new. Reportedly, monks were responsible for introducing pike into Ireland in the 14th century, potentially making them the first recorded bucket biologists.

Despite being a tasty and sporting species, pike that are illegally introduced often harm existing fish populations, especially trout and other salmonids.

RISKY AFFAIR

Anglers who illegally introduce new species believe they are providing additional recreation. Yet the wrong fish can actually decrease angling opportunities by eating or competing with existing game species. Fisheries managers strive for a natural balance between predator and prey fish, and moving fish is always a risky affair. Legal introductions are done only after thorough environmental review and risk analysis show that potential problems will be minor. Scofflaws just dump fish and hope for the best. But that almost always upsets the balance of the fishery.

That's why Montana Trout Unlimited, Fishing Outfitters Association of Montana, Invasive Species Action Network, Montana B.A.S.S. Federation Nation, Montana Wildlife Federation, Montana Catfish Association, Walleyes Forever of Montana, Montana Walleyes Unlimited, and Montana Pikemasters have denounced illegal stocking of all species.

It's unlikely that Montana will ever be able to eradicate its illegally introduced northern pike populations. And most suitable waters already have had pike legally introduced. So it makes sense for anglers to pursue these fish in those locations and enjoy doing so. But pike absolutely should not be spread elsewhere. Though I love fishing for water wolves, I don't want to see them anywhere in Montana except where they currently swim.

Do pike eat ducklings?

One of the most enduring northern pike legends is that the predator fish commonly target vulnerable ducklings swimming around lake shallows. It can happen. In the early 1940s, researchers in northern Canada estimated that northern pike consumed 10 percent of the ducklings in two major duck-producing river deltas.

Yet in 1942, two Michigan biologists watched ducklings swim in a marsh containing northern pike at the Seney National Wildlife Refuge for a total of 5,535 minutes, but saw no attacks. Unconvinced, one biologist captured a duckling and tethered it to a pole to splash around. Still no attacks. So he towed it back and forth across the pool, and yet not a single northern pike went after it. (Needless to say, biologists don't conduct experiments like that anymore.)

When Jack Tipping, of the Washington Department of Fish and Wildlife, compiled a list of the stomach contents of 50,000 pike, muskies, and tiger muskies sampled across North America, he found only a few dozen ducklings. In addition to the countless small fish in the 50,000 stomachs, Tipping found one young red-winged blackbird; one snake; one baby muskrat; 22 mice or voles; six unidentified small mammals; 44 frogs, tadpoles, or mudpuppies; and 45 waterfowl (mostly ducklings and coots, and one wood duck).

Saving the little bolts

BY TOM DICKSON

You've probably never heard of the redside shiner or the grasshopper sparrow. For good reason. No one fishes for shiners, so they are pretty much invisible. And few people could distinguish the grasshopper sparrow from any of the dozen or so other "LBJs" (little brown jobs) flying around a field.

Yet people do know and care about these and hundreds of other species that live in Montana. For years they've tried to explain why the rest of us should, too.

One argument maintains that the natural world is important simply for its own sake. This "intrinsic value" thinking compels many conservationists and environmentalists. An organism or species is worthy enough as itself, regardless of its economic "instrumental value." A tree is still valuable even if it can't be converted into timber.

Besides being abstract, the problem with this approach is that it grants all species equal importance. Sure, a majestic old-growth cedar has value, but what about a scrubby shrub?

Or, for that matter, a woodtick?

Basing conservation on the intrinsic value of nature implies that our responsibility for saving shiners and sparrows equals that of protecting trout and bald eagles. Yet we know that most people see greater worth in game fish and large raptors than in smaller, less entertaining species.

Values beyond intrinsic ones, then, are required to make a compelling case for caring about all wild things.

Starting in the 1990s, conservationists began to calculate ways animals and plants enrich our lives just by being there—benefits known as "ecosystem services." Some services come from individual species. Bees pollinate crops. Bats eat disease-carrying mosquitoes. Foxes prey on pesky rodents. Yews provide medicine for treating cancer. The field of biomimicry echoes animal biology and ecology in engineering and design principles, such as aerodynamic trains modeled after a kingfisher's beak, and energy-efficient buildings based on termite mound construction.

Other benefits come from ecosystems themselves. Wetlands act as sponges that lessen flooding by absorbing runoff, then purify the water for human consumption downstream. Insects and microbes break down organic material into soil that grows trees. Forests and grasslands take in carbon dioxide and produce oxygen.

It might not make much difference, or it might alter an entire ecosystem. The thing is, for most species, we don't really know.

Even if we don't know exactly how any specific part contributes to an ecosystem, we can assume it has a role; otherwise it wouldn't be there. The redside shiner somehow fits into northwestern Montana river ecosystems that produce westslope cutthroat trout prized by anglers. The grasshopper sparrow plays a role in grassland ecology, perhaps by consuming insects that would otherwise damage crops.

Allowing these or any other species to disappear might not make much difference, or it might alter an entire ecosystem. The thing is, for most species, we don't really know.

Maybe Montana's hundreds of obscure species are like the small bolts in a truck engine. If you lost some of the bolts holding, for instance, the cover to the cylinder head, the truck might hum along for weeks, maybe months. But at some point the cover would come loose and the engine would conk out.

"To keep every cog and wheel is the first precaution of intelligent tinkering," Aldo Leopold wrote 70 years ago. To enrich our lives, we humans have tinkered a lot with the natural world. The food we eat, the electricity we use, the wood and metal that build our homes and vehicles—all that and more comes from altering the environment to meet our needs. We can't turn back time and not plow prairies, log forests, build dams, or mine copper—even if we wanted to. But we can value and conserve the shiners, sparrows, and other seemingly insignificant species still out there. Not out of moral duty or guilt, but because it's the wise thing to do.

We still don't fully understand how the natural world works, and may never get there. But we should still retain all the parts. We might need them someday to keep the engine running. There's no auto parts store for these pieces. Once they're gone, they're gone for good.

Tom Dickson is editor of Montana Outdoors.

ILLUSTRATION BY STAN FELLOWS

Giant water bug

By Heather Fraley

I plunge my dip net into the foul-smelling muck of a stagnant pond and sweep it around. Looking at the wriggly contents of the net, I'm as excited as a kid on Christmas morning. Today, I've hit the invertebrate jackpot: one of Montana's largest aquatic insects, a deadly, streamlined predator known as the giant water bug.

IDENTIFICATION

The giant water bug is shaped like a cockroach. It has a flat, oval body about two inches long with a four-inch wingspan. Its mottled, brown coloring blends perfectly with the bottom of ponds. The bug's sharp beak tucks up under its head between two bulbous, oval eyes. Long, grasping forelegs with terminal hooks extend out from its head. Two rear legs are slightly flattened for efficient swimming.

At first glance, the giant water bug is often mistaken for a beetle. Closer examination reveals the soft, leathery outer wing that identifies the insect as being in the order Hemiptera, or true bugs. Montana is home to two nearly identical looking species of giant water bug: *Lethocerus americanus* and *Belostoma fluminea*.

HABITAT AND RANGE

Giant water bugs are found in still or slow-moving water in ponds, sloughs, or wetlands. They range throughout the United States and Canada and across Montana.

REPRODUCTION AND LIFE CYCLE

A single female can lay up to 150 eggs in her life. A female of the *Belostoma* genus lays her eggs on the back or folded wings of a male. Then she leaves him to incubate the glued-on glob until the eggs hatch. A female of the *Lethocerus* genus deposits her eggs in rows above water on aquatic vegetation. Neither she nor the male watches over the eggs.

Giant water bug eggs, laid in early summer, hatch into nymphs after incubating for two weeks. Life as a giant water bug nymph is harsh because of cannibalism and predation, so very few survive the month or so it takes to reach adulthood. Adult giant water bugs, however, are strong fliers and swimmers and often can escape large fish and other predators.

BEHAVIOR

Giant water bugs are fierce "ambush predators" that wait for insects, small fish, and amphibians to cross their path. The entomology journal *Psyche* once described them as having "extreme voraciousness." The grasping raptorial forelegs ending in tarsal claws are ideal for snatching and pulling prey close to the bug's piercing beak. These legs are surprisingly strong. If held by a human, the giant water bug may try to pull a finger within stabbing range.

After capturing its prey, the giant water bug stabs its sharp beak into the body and injects a powerful toxin. The toxin first paralyzes the prey, then liquefies the internal parts, which the giant water bug sucks up like a protein milkshake.

There are even reports of giant water bugs killing fish. In 1923, a Montana man observed a giant water bug floating on the surface of a creek near Ovando, waving its leg. As reported in *Psyche*, a trout "grabbed the water bug by the leg...whereupon the bug raised up and sunk its beak into the top of the fish's head. The trout began to swim excitedly in circles and jumped clear of the water several times. It finally turned over on its back."

Nicknames include "electric light bugs," because they are attracted to streetlights and "toe biter" because they occasionally deliver a painful chomp to the submerged digits of unsuspecting swimmers.

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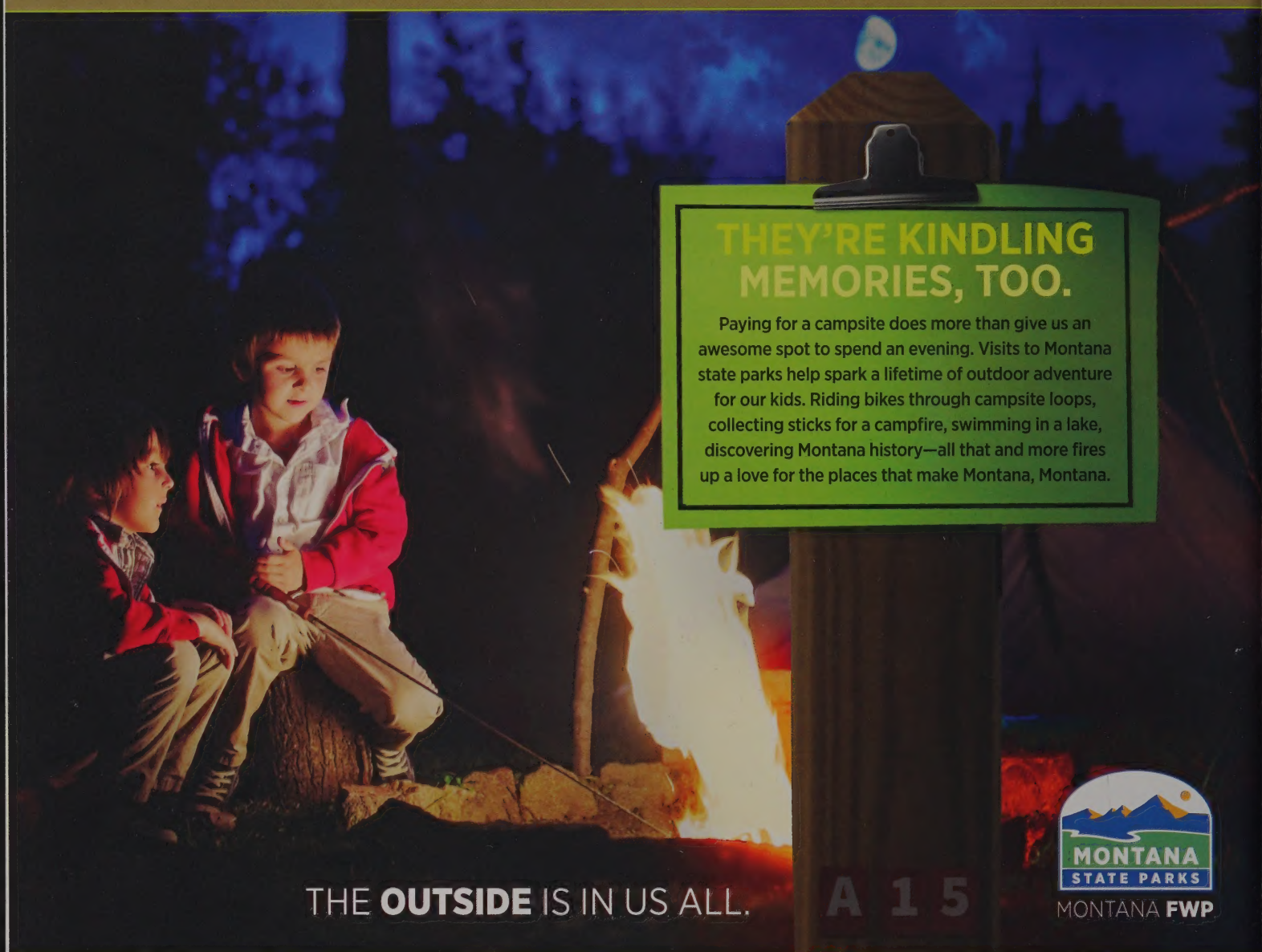
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